

INCH-POUND

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2 July 1995

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2 October 1990

DEPARTMENT OF DEFENSE
STANDARD PRACTICE FOR
MANUALS, TECHNICAL:
GENERAL STYLE AND FORMAT REQUIREMENTS



AMSC N/A

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MIL-STD-38784

FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Det 2, HQ ESC/AV-2, Wright-Patterson AFB, OH 45431-1672, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

NOTICE OF
VALIDATION

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MIL-STD-38784
NOTICE 2
01 December 2000

DEPARTMENT OF DEFENSE

STANDARD PRACTICE FOR
MANUALS, TECHNICAL:
GENERAL STYLE AND FORMAT REQUIREMENTS

MIL-STD-38784, dated 2 July 1995, and Notice 1, dated 15 November 2000, has been reviewed and determined to be valid for use in acquisition.

Custodians

Army - TM
Navy - OS

Preparing Activity

Air Force - 16

Review Activities

Army - AR, AT, CE, CR, MI
Navy - AS, EC, MC, SH, TD, YD
Air Force - 01, 99
DLA - GS, IS

AMSC N/A

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NOTICE OF
CHANGE

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MIL-STD-38784

NOTICE 1

15 November 2000

DEPARTMENT OF DEFENSE

STANDARD PRACTICE FOR
MANUALS, TECHNICAL:
GENERAL STYLE AND FORMAT REQUIREMENTS

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iv	15 November 2000	iv	2 July 1995
v	02 July 1995		Reprinted without change
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ix	15 November 2000	ix	2 July 1995
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3	15 November 2000	3	2 July 1995
4	15 November 2000	4	2 July 1995
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27	15 November 2000	27	2 July 1995
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3. Holders of MIL-STD-38784 will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by the stocking points until the standard is completely revised or canceled.

Custodians

Army - TM

Navy - OS

Preparing Activity

Air Force - 16

(Project: TMSS-O327)

Review Activities

Army - AR, AT, CE, CR, MI

Navy - AS, EC, MC, SH, TD, YD

Air Force - 01, 99

DLA - GS, IS

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MIL-STD-38784

1 SCOPE.

1.1 Scope. This standard covers the general style and format requirements for the preparation of standard technical manuals (TM) and changes thereto. This includes all technical documents assigned a TM identification number and controlled by a TM management information system, or subject to requisition from an inventory control point. In addition to "paper" delivery, this standard provides for standard generalized markup language (SGML) document type definition (DTD) usage (see appendixes B through E) required for electronic data delivery. This standard supplements the performance or detail specifications used for specific TM types and related publications, but does not deliver any technical data. Unless specified otherwise herein, the examples at the end of this standard are typical and may be adapted to fit the specific equipment or situation being covered. All appendixes are intended for compliance when applicable.

2 APPLICABLE DOCUMENTS.

2.1 General. The documents listed in this section are specified in sections 3, 4, and 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, and 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-882	Standard Practice for System Safety
MIL-STD-1309	Definition of Terms for Automatic Electronic Test and Checkout
MIL-STD-1808	System Subsystem Sub-subsystem (SSSN) Numbering
MIL-STD-1840	Automated Interchange of Technical Information

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-PRF-38807	Technical Manuals - Illustrated Parts Breakdown
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HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-38790	Printing Production of Technical Manuals (Replaces MIL-P-38790)
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(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings and publications form a part of this standard to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2).

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PUBLICATIONS

DEPARTMENT OF DEFENSE

DOD 5025.1	DoD Directives System
DOD 5200.1-R	DoD Information Security Program
DOD 5220.22-M	National Industrial Security Program Operating Manual (NISPOM)
DODD 5230.24	Distribution Statements on Technical Documents (Replaces MIL-STD-1806)

GOVERNMENT PRINTING OFFICE

GP 1.23/4: St 9/984	US Government Printing Office Style Manual
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JOINT CHIEFS OF STAFF

JCS Pub. 1	DOD Dictionary of Military and Associated Terms
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(Application for copies should be addressed to the Superintendent of Documents, US Government Printing Office, Washington, DC 20402.)

2.3 Non-government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

STANDARDS

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME-Y14.38M	Abbreviations for Use on Drawings and in Specifications, Standards, and Technical Documents (Replaces MIL-STD-12)
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(Application for copies should be addressed to the American Society of Mechanical Engineers, 22 Law Drive, Fairfield, NJ 0700-2300.)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

IEEE-ASTM-SI-10	Standard for use for the International Units (SI): The Modern Metric System (Replaces ASTM E380-86)
IEEE 945-84	IEEE Recommended Practice for Preferred Metric Units for Use in Electrical and Electronics Science and Technology

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NJ 10017 or from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

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2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS.

3.1 Acronyms used in this standard. The acronyms used in this standard are defined as follows:

- | | | | |
|----|--------|---|-------------------------------------------------------------|
| a. | AFTO | - | Air Force Technical Order |
| b. | AMSC | - | Acquisition Management Systems Control |
| c. | ASTM | - | American Society for Testing Materials |
| d. | BBS | - | Bulletin Board System |
| e. | CALS | - | Continuous Acquisition and Life-Cycle Support |
| f. | DA | - | Department of the Army |
| g. | DAEP | - | Department of the Army Equipment Publication |
| h. | DEP | - | Draft Equipment Publication |
| i. | DoD | - | Department of Defense |
| j. | DODISS | - | Department of Defense Index of Specifications and Standards |
| k. | DTD | - | Document Type Definition |
| l. | ECP | - | Engineering Change Proposal |
| m. | ESDS | - | Electrostatic Discharge Sensitive |
| n. | EUT&E | - | Early User Test and Experimentation |
| o. | FCP | - | Fracture/Fatigue Critical Part |
| p. | FDEP | - | Final Draft Equipment Publication |
| q. | FIPS | - | Federal Information Processing Standards |
| r. | FOSI | - | Formatting Output Specification Instance |
| s. | FOT&E | - | Follow-on Test and Evaluation |
| t. | FRC | - | Final Reproducible Copy |
| u. | FTP | - | File Transfer Protocol |

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v.	GFI	-	Government Furnished Information
w.	HCP	-	Hardness Critical Processes
x.	IEEE	-	Institute of Electrical and Electronics Engineers
y.	IPB	-	Illustrated Parts Breakdown
z.	ISO	-	International Organization for Standardization
aa.	IOT&E	-	Initial Operational Test and Evaluation
ab.	LSAR	-	Logistics Support Analysis Record
ac.	NSP	-	Nuclear Surety Procedures
ad.	O&SHA	-	Operating and Support Hazard Analysis
ae.	OCI/OCP	-	Observable Critical Item/Process
af.	OSH	-	Occupational Safety and Health
ag.	OSHA	-	Occupational Safety and Health Act
ah.	PDEP	-	Preliminary Draft Equipment Publication
ai.	PHA	-	Preliminary Hazard Analysis
aj.	PTM	-	Preliminary Technical Manual
ak.	PTO	-	Preliminary Technical Order
al.	RDC	-	Review Draft Copy
am.	SGML	-	Standard Generalized Markup Language
an.	S/S/SN	-	System/Subsystem/Subject Number
ao.	TCTO	-	Time Compliance Technical Order
ap.	TM	-	Technical Manual
aq.	TMINS	-	Technical Manual Identification Number System
ar.	TOPS	-	Technical Order Page Supplement
as.	TTI	-	Technical Test I
at.	USAPPC	-	US Army Publication and Printing Command

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3.2 Definitions.

3.2.1 Apron (blank apron). A blank area starting at the binding edge of foldout pages (see 3.2.16) which is slightly wider than a normal page. The blank apron permits the technician to use a foldout while reading the associated text. MIL-P-38790 gives dimensions for blank aprons.

3.2.2 Boxhead title. Those titles which are enclosed by rules at the head of a column on tables and charts prepared as tables.

3.2.3 Callout. Anything placed on an illustration to aid in identifying the objects being illustrated, such as index numbers, nomenclatures, leader lines, arrows and, when placed directly on the illustration, legends.

3.2.4 Caution. Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness. Cautions are further explained in Appendix A.

3.2.5 Change. A change is comprised of corrected pages to the basic manual. It consists of information that improves or clarifies the basic manual without requiring rewriting or reorganization of the technical content of the basic manual.

3.2.6 Change designator. A unique number or letter used to differentiate each change page from the original pages and to differentiate among changes.

3.2.7 Chapter. The first major functional division of a publication.

3.2.8 Continuous tone artwork. All artwork containing tonal values of gray as well as black, which are not created by lines or dots, shall be considered continuous tone artwork.

3.2.9 Copy freeze date. The copy freeze date is a date after which no additions, deletions, or changes will be accepted to the publication material. Additions, deletions, and changes after that date will be accumulated for preparation of a subsequent change or revision of the publication.

3.2.10 Cutline. A cutline is used in the RDC as a "placeholder" to show where a table or illustration will be placed when it becomes available. Cutline is also referred to as a cut-in.

3.2.11 Department of the Army Equipment Publication(s) (DAEP). (A) Those publications that have been authenticated, printed, and distributed for use during the production and operations phase of the life cycle of the equipment.

3.2.12 Draft Equipment Publication(s) (DEP). (A) Those publications prepared during the full scale development phase of the equipment which are used for Technical Test I (TTI) and user tests (Initial Operational Test and Evaluation [IOT&E]), usually with prototype models of equipment. The DEP is also used for coordination and review by user agencies (FORSCOM and TRADOC) and for verification. The DEP also designates the publication that is sent for user coordination during revision of Department of the Army (DA) equipment publications.

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- a. The DEP is prepared in the format prescribed by applicable detail specification. It is an updated version of the Preliminary Draft Equipment Publication (PDEP) which includes all changes as a result of the validation and early technical and user testing (TTI and Early User Test and Experimentation [EUT&E]) and physical tear down function of the maintenance evaluation.
- b. The definition replaces terms formerly used to refer to publications used for the above purpose and phase of development (draft manuscript, draft equipment manual, draft TM, preliminary manuscripts, review copy, etc.).
- c. DEPs prepared prior to Milestone III (full rate production decision) may be prepared in typewritten manuscript form following the Content/Format Summary Sheet of the applicable detail specification, integrating text and illustrations appropriately.


3.2.13 Equipment publication manuscript. (A) The documentation used in preparation of the PDEP, DEP, or FDEP. It may be in any form (typewritten or handwritten, reproducible copy, drawings, illustrations, unchanged publication pages, changed publication pages, etc.). When the term "manuscript" is used, it shall be prefaced with the type of publication, e.g. PDEP manuscript, DEP manuscript, etc. When PDEP or DEP manuscripts are ready for reproduction to be distributed to test and user agencies for evaluation and coordination, the word manuscript will be dropped and the title PDEP or DEP (as appropriate) will be used.

3.2.14 Final Draft Equipment Publication(s) (FDEP). (A) Those publications prepared during the final development or initial production phase of the equipment and used for printing of the DA equipment publication.

- a. The FDEP is the final document (final reproducible copy) with illustrations, ready for transmittal to the US Army Publication and Printing Command (USAPPC) for printing and publication as an authenticated DA equipment publication. The FDEP includes all necessary changes and final resolutions of all comments and recommendations made as a result of technical and user testing (TTI, TTII, EUT&E, IOT&E, and Follow-On Test and Evaluation [FOT&E]), if conducted, service test, validation/ verification, user coordination, and maintenance literature conference.
- b. This definition replaces terms formerly used to refer to publications used for the above purpose and phase of development (final manuscript, final draft manuscript, final draft TM, draft TM, manuscript for review, etc.).

3.2.15 Final reproducible copy. The final document ready for reproduction and publication as an authenticated TM including all necessary changes made as a result of validation/verification and acquiring activity conditions of acceptance or approval. The delivery media includes, but is not limited to, reproducible camera-ready copy, direct image copies, negatives, disks, tapes, etc, as specified. For Army, FRC equates to FDEP (see 3.2.14).

3.2.16 Foldout page. A foldout page has the same height as, but is wider than, a standard page. Foldout pages are folded either 2, 4 or 6 times (depending on width) to assume the dimensions of a standard page.

3.2.17 Icon. Icons are pictorial images which may be used in lieu of words. For example: the icon  is used to represent "Electrostatic Discharge Sensitive." See 4.3.10.1 and Appendix A for authorized icons.

3.2.18 Index numbers/letters. Those callouts which consist of a number or letter referenced from text or leading to a legend (see 3.2.23).

3.2.19 Issue indicator. The issue indicator states the level of change or revision of the manual, e.g. Original, Change 1, Change 2, Revision 1, Revision 2, etc.

3.2.20 Layout page. A blank sheet showing margin data only, used by an editor to indicate where text, illustrations, tabular data, etc, will appear in the final reproducible copy. Text, line drawings and tabular data can be prepared separately, then firmly attached to the layout page or digitally merged to form the final reproducible copy.

3.2.21 Leader lines. A line with or without arrowhead extending from index number or letter/nomenclature to item.

3.2.22 Leading. Leading is the vertical spacing between lines of type measured from baseline to baseline (bottom of line to bottom of next line below). Leading is measured in points.

3.2.23 Legend. A tabular listing of the index numbers/letters and their meanings.

3.2.24 Module. (A) Integrated text and illustration covering performance of a task procedure/step.

3.2.25 Multivolume manuals. Multivolume manuals are assigned individual TM identification numbers. If a volume, because of its bulk, warrants being further divided, the acquiring activity will decide how these divisions shall be identified. When specified for use by the acquiring activity, volumes shall be used when a publication exceeds 1,500 printed pages (750 sheets). Foldouts are counted in page units (sheets).

3.2.26 Nomenclature callout. Nomenclatures or partial nomenclatures placed directly on the illustration; e.g. "power supply", "1/2-inch lock nut."

3.2.27 Note. Highlights an essential operating or maintenance procedure, condition, or statement.

3.2.28 Part. A part is the next lower division of a publication below volume. Parts should normally be separately bound.

3.2.29 Permanent change package. (N) A controlled permanent change to the basic manual or revision comprised of change instruction sheet, certification sheet, title page, list of effective pages and replacement or additional pages. Each package is identified by a unique TM identification number and each replacement or added page is identified by a change designator.

3.2.30 Preliminary Draft Equipment Publication(s) (PDEP). (A) Those publications prepared during the development phase of the equipment which are used for validation and early technical and user testing (TTI and Early User Test and Experimentation [EUT&E]). The PDEP need not conform to format requirements of the applicable detail specification. The PDEP may be in the form of printed books or manuscript, or they may be a package of documentation such as a draft

maintenance allocation chart, engineer drawings, technical data extracted from the Logistics Support Analysis Record (LSAR) or from other data required for operation and maintenance of the equipment. The PDEP is used as the basis for preparation of the draft equipment publications and may be used as source data for developing New Equipment Training (NET) and other training requirements.

3.2.31 Preliminary technical manual. A PTM is intended for interim use to make the technical information available for test, verification, training purposes and operational use pending receipt of final reproducible copy and distribution of printed manuals. PTMs shall be complete and validated accurate. PTMs shall be superseded by final printed manuals. For Army, PTM equates to DEP (see 3.2.12). For Air Force, PTM equates to Verification PTO.

3.2.32 Review Draft Copy (RDC). The review draft copy is used for review and coordination for technical accuracy and adequacy to evaluate the contractor's progress and assess compliance with applicable specifications and terms of the contract. For Army, RDC equates to PDEP (see 3.2.30). For Navy, RDC equates to review manuscript.

3.2.33 Revision. A revision is a second or subsequent edition of a manual which normally supersedes the preceding edition.

3.2.33.1 Update revision. An update revision incorporates the basic manual, all previous changes, and new data that would require the issuance of an additional change. The update is prepared by incorporating applicable portions of pages in the manual (paste-up or minor composition) without requiring rewrite or reorganization of the technical content of the material. It is prepared in the style and format of the basic manual.

3.2.33.2 Complete revision. A complete revision requires rewrite or reorganization of the technical content of the material and is prepared in accordance with the current detail specification and as outlined by this standard.

3.2.33.3 Nonsuperseding revision. Normally revisions supersede the preceding edition. However, when a new manual is needed to cover a different configuration of a system or equipment for which there is a high degree of commonality, a nonsuperseding revision can be acquired to minimize cost. A nonsuperseding revision will stand on its own and shall be identified by a unique TM identification number.

3.2.33.4 Pickup revision. A pickup revision incorporates the basic manual, all previous changes and the new data that would require the issuance of an additional change. Only those changed, revised, or added pages shall have the current change number and date. Other existing pages shall be reissued without changes to dates, change symbols or other modification.

3.2.34 Section. The first major functional subdivision of a chapter.

3.2.35 Set. A set is a number of individual manuals or volumes which comprises a complete TM package of information for an item.

3.2.36 Standard technical manual. A standard TM is any TM that does not require a new concept or special presentation of data that cannot, or should not, be constrained by the size and format requirements of this standard.

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3.2.37 Supplement. A supplement is a complimentary TM which supplements information in a related TM.

3.2.38 Technical manual. TMs are publications that contain instructions for the installation, operation, maintenance, training, and support of weapon systems, weapon system components and support equipment. TM information may be presented in any form or characteristic including, but not limited to, hard copy, audio and visual displays, magnetic tape, discs, and other electronic devices. A TM normally contains operational and maintenance instructions, parts lists or parts breakdowns, and related technical information or procedures exclusive of administration procedures. Technical Orders (TO) that meet the criteria of this definition may also be classified as TMs.

3.2.39 Volume. The first separately bound subdivision of a publication.

3.2.40 Warning. Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which, if not strictly observed, could result in injury to, or death of, personnel or long term health hazards. Warnings are further explained in Appendix A of this standard.

4. GENERAL REQUIREMENTS.

4.1 General.

4.1.1 Advertising. TMs shall contain no advertising except as required by 4.5.1.3.6.

4.1.2 Copyrighted material. Technical manuals shall not contain copyrighted material except as specified in the Federal Acquisition Regulations/Defense Federal Acquisition Regulation Supplement. When copyrighted material is to be included in a technical publication, the preparer shall obtain prior written permission from the copyright owner/authorized agent for its use. The signed, written permission shall be delivered with the final reproducible copy when it is delivered. The written permission shall contain a statement declaring whether or not a copyright credit line is required (see 4.5.1.14).

4.1.3 Jointly used manuals. When manuals are acquired by one Service for joint use with another Service, see 4.2.1.5 regarding Army, Navy, Marine Corps and Air Force TM identification numbers. See Figure 1, Note 2, regarding showing two or more TM identification numbers on cover/title. Paragraphs in joint publications which do not apply to all Services concerned, shall be marked to indicate the Services to which they apply. For example: "4.4 (ARMY ONLY) THE LANDING GEAR."

4.1.4 Manual outline. When specified by the acquiring activity (see 6.2) or detail specification, a manual outline shall contain the following:

- a. A text outline that shall be in accordance with the requirements of the detail specification, showing volume, part, chapter, section and paragraph titles to indicate the intended coverage of the various aspects of the equipment or system. Each paragraph title or notation shall be followed by a brief statement outlining the information to be presented. The text outline shall clearly show the specific equipment/system and related procedures/data planned for inclusion in the manual.
- b. An illustration outline and a table outline that shall be keyed to the text outline. Each illustration and table listed in the outlines shall be described. The illustration outline shall contain figure numbers, title, information, intent, approximate size and nature of illustration (exploded view, schematic, line drawing). The table outline shall describe the tables by table number and information content.
- c. An estimated page count for each chapter and a statement indicating the scope, depth or coverage.

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4.1.5 Preliminary Technical Manual (PTM) (see 3.2.31). When specified by the acquiring activity (see 6.2), PTM copies of the manual to be provided as interim editions, preliminary issues for training purposes or for other early uses shall have the same style and format as the final reproducible copy.

4.1.6 Source data. The primary source data for TMs shall be engineering drawings and, if a contract requirement, the Logistics Support Analysis and Logistics Support Analysis Record (LSAR). Sound engineering principles and techniques, available engineering analyses, service experience, performance data on the item and on similar items, and all other reliability and maintainability data available shall be used in the preparation of specific instructions.

4.1.7 Manual types. Three types of technical manuals (see 3.2.38) are addressed by this standard (see 6.2): Review Draft Copy (RDC) (see 3.2.32); Preliminary Technical Manuals (PTM) (see 3.2.31); and Final Reproducible Copy (FRC) (see 3.2.15).

4.2 Format.

4.2.1 Preparation methods.

- a. Review Draft Copy (RDC) (see 3.2.32). The RDC shall be technically edited and shall be computer generated or typewritten, double spaced, on one side of the sheet only. The RDC may be issued initially in single column format, and may contain voids where information is not available. When the RDC is presented in computer or other form such that the paragraphing or symbols cannot be readily understood it shall be annotated to make the paragraphing and symbols clear to the reviewer. Except for certain presentations authorized by the acquiring activity, the page size and image area shall be in accordance with 4.2.1.2. The binding edge shall not be less than 1-inch and the outside edge not less than 1/4-inch. The method of duplication, covering and binding shall provide legible, collated copies.
- b. Preliminary Technical Manual (PTM) (see 3.2.31). The PTM shall be developed in accordance with the applicable detail specifications so that the conversion effort from preliminary to FRC is minimal. The PTM shall contain all front matter, text, illustrations and tables to be included in the manual as specified in the detail specification. The PTM shall be technically edited, validated and shall be computer generated or typewritten. The page size and image area shall be in accordance with 4.2.1.2. The method of duplication, covering and binding shall provide legible, collated copies.
- c. Final Reproducible Copy (FRC) (see 3.2.15). The FRC shall include all text pages (including tabular data and emergency page markings when applicable) and reproducible artwork suitable for reproduction. FRC shall be in accordance with MIL-HDBK-38790 supplied in final size (see 4.2.1.2.1). If required, reduction shall be obtained by positive to positive production without the use of negatives. Type styles and sizes shall be comparable to those shown in Table I. The FRC shall be of a quality which will permit reduction to 16mm or 35mm negatives (multiframe negatives for foldouts [see 3.1.16]) suitable for subsequent enlargement to full size photolithographic negatives which may be used to produce offset printing plates. Appendix B provides the DTD for electronic delivery of data. Unless otherwise specified (see 6.2), the FRC shall have the following minimum acceptable features:
 - (1) Single or double column format for 8 1/2 by 11-inch and larger manuals, as specified (see 6.2) single column format for smaller manuals.

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- (2) Single spacing.
- (3) (N) (M) (F) Justified right margins. (A) Unjustified right margins.
- (4) Headings prepared on the same composing equipment as the text.
- (5) FRC paper stock shall meet or exceed the requirements of JCP-D10 (20 pound).
- (6) FRC printing (or ink) shall be of such color and consistent contrast to permit quality reproduction.

4.2.1.1 Final reproducible copy leading and vertical spacing. Layout shall conserve space without lessening usability or clarity of material (see Figure 2). Blank pages and spaces shall be avoided whenever possible. Leading (see 3.2.22) and vertical spacing as indicated by Table I shall be used for best legibility and conservation of space. Double spacing of text within a paragraph, or similar wastefulness, is unacceptable. Layout practices shall not result in:

- a. The first line of a paragraph being at the bottom of a page or column.
- b. The last line of a paragraph being at the top of a new page.
- c. A sidehead falling on the last line of a page or column.
- d. Warnings, cautions and notes (see 3.2.40, 3.2.4 and 3.2.27) being divided so that first lines or group of icons (see 3.2.17) appear on one page and remaining lines or group of icons on another (first lines or group of icons may appear in the left column with remaining lines in the right column on the same page).
- e. Warnings, cautions and notes being separated from the paragraph they apply to (warnings, cautions and notes may appear in the left column with applicable paragraphs in the right column on the same page).
- f. Undesirable location of an illustration or table.

4.2.1.2 Page size and reproduction area for final reproducible copy. Text and artwork shall not exceed the following dimensions for the indicated size manual. Unless otherwise specified (see 6.2), manuals shall be prepared in 8 1/2 by 11-inch size. When specified, manuals shall be produced in accordance with the dimensions below.

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Paper Size of Printed Manuals (Inches)	Width - Text/Art		Depth - Text/Art		Depth (Including Marginal Copy)	
	(Inches)	(Picas)	(Inches)	(Picas)	(Inches)	(Picas)
#4 by 5 1/2	3 1/8	19	4 1/2	27	5	30
4 1/2 by 7	3 5/8	22	6	36	6 1/2	39
4 by 8	3 1/8	19	7	42	7 1/2	45
4 1/2 by 8	3 1/2	21	7	42	7 1/2	45
5 1/2 by 7	4 1/2	27	5 3/4	35	6 1/4	38
5 by 8	4 1/8	25	7	42	7 1/2	45
6 1/2 by 9 1/2	5 1/2	33	8 1/2	51	19	54
9 1/2 by 6 1/2	8 1/2	51	5 1/2	33	6	36
8 1/2 by 11	*7 1/4	44	9 2/5	54	10	60
17 by 11	15 3/4	94	9	54	10	60

A 4 by 5 1/2-inch manual, volume, or part shall not exceed 200 pages (100 sheets).

* Double column, each column shall be approximately 3 1/2-inches wide with an approximately 1/4-inch gutter between. Single column shall be 7 1/4-inches wide.

4.2.1.2.1 Oversize reproducible copy. Unless otherwise specified (see 6.2), final reproducible copy shall be supplied final size. When specified, reproducible copy may be prepared oversize not to exceed 50 percent larger than the prescribed image area for each printed manual page size. Type shall be of such size that after final reduction the text shall be no smaller than that prescribed in Table I and Figure 1. When oversize final reproducible copy is specified, reduction from negatives shall be in accordance with MIL-HDBK-38790.

4.2.1.3 Margin data. Margin data (generally the running heads and feet) shall be placed outside that portion of the page used for either narrative text, full page tabular data or full page illustrations, but within the printing area dimensions of the page. When applicable, margin data also consists of the change number, security classification, page content/equipment identification, figure number and figure title. See 4.7.3.7 for deleted pages statement. The margin data shall be mounted on full page illustrations, including those for foldout pages (see 3.2.16) that have been prepared in exact printing size (or in the same size as text pages). Margin data shall not be on an overlay. Text may be separately prepared in single column galleys and then attached to the appropriate layout page (see 3.2.20).

4.2.1.4 Running heads and feet. Complete running heads and feet shall be included on all pages except title pages or pages otherwise blank. Blank pages which back up classified pages shall be marked with the security classification of the backed up page.

4.2.1.4.1 Running heads.

4.2.1.4.1.1 Security classification. The security classification, including unclassified pages, of classified manuals shall be at the top center of each page in bold face type in accordance with DOD

5220.22-M. For foldouts, the security classification shall be marked in bold face type, 3/4-inch from the right hand edge and repeated continuously to the left with four inches of space between each marking.

4.2.1.4.1.2 TM identification number. The TM identification number, as assigned for each volume and part, shall be in bold face type at the upper outer edge of each page and outer segment (page unit) of each foldout page.

4.2.1.4.1.3 Binding edge (equipment or subject identification). When specified (see 6.2), the binding edge shall indicate the equipment or subject to which the manual applies and relate to the prime title. Appropriate abbreviations may be used. Top-bound manuals shall place this information on the top, left-hand corner.

4.2.1.4.1.4 Outer edge (reference information). When specified (see 6.2) significant reference information such as chapter, section or subject titles, paragraph number or figure number shall be used or added. Appropriate abbreviations may be used. Top bound manuals shall have this information placed on the top, right-hand corner.

4.2.1.4.2 Running feet.

4.2.1.4.2.1 Page number. Page numbers shall be located at the lower outer edge ending at the outside margin and shall be in bold face type. Even numbers, including zero, shall be assigned to left-hand pages and odd numbers to right-hand pages. The page number for a foldout page shall be so placed (lower outer edge ending at the outside margin) that the number will be visible when the printed page is folded.

4.2.1.4.2.2 System/Subsystem/Subject Number (S/S/SN). When used, the S/S/SN shall appear in the lower outer corner of each page directly above the page number and shall be approximately 18 point type. S/S/SN shall not be placed at the bottom of front matter pages.

4.2.1.4.2.3 Issue indicator (see 3.2.19). When specified (see 6.2), the issue indicator of basic manuals, revisions and the change designator (see 3.2.6) for change pages shall be located at the outer edge of all pages on the same line as, and 1/2-inch to the inside of, the page number. When specified (see 6.2), the word "Original" shall be included on basic pages.

4.2.1.4.2.4 Security classification. The security classification, including unclassified pages, of classified manuals shall be at the bottom center of each page in bold face type. See DOD 5220.22-M for guidance. For foldouts, the security classification shall be marked in bold face type, 3/4-inch from the right-hand edge and repeated continuously to the left with four inches of space between each marking.

4.2.1.4.2.5 Foldout figure number and title. The figure number and title for a foldout page (see 3.2.16) shall be so placed (lower outer corner) that the number will be visible when the printed page is folded.

4.2.1.5 Technical manual identification number. The TM identification number assigned by the acquiring activity shall be located on each page as specified in 4.2.1.4.1.2. However, when all the information for a 4 by 5 1/2, 4 by 8, 4 1/2 by 7 or 5 by 8-inch manual is placed horizontally on all pages and all pages are arranged head to foot, the TM identification number shall be placed in the

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upper right corner of all pages. If the publication is jointly used, each Service's number shall be prefixed with the word Army, Navy (NAVSEA) (NAVAIR) (SPAWARS), Marine Corps or Air Force as applicable. The acquiring activity's TM identification number shall be placed above the using activity's TM identification number. The using activity's numbers shall be in alphabetic sequence (by Service name) following the acquiring activity's number. For example:

NAVY (NAVAIR)	AI-F18AA-WRM-070
ARMY	TM 11-1510-204-34
AIR FORCE	TO 21M-LGM30G-12
MARINE CORPS	TM-12345/1
NAVY (NAVSEA)	SE211-FA-MMA-010/SPS-10A

4.2.2 Numbering of pages, tables, illustrations, footnotes and appendixes.

4.2.2.1 Review draft copy (see 3.2.32). Page numbering techniques shall approximate that to be used in the final reproducible copy. These page numbers are used only to establish the continuity of the RDC and have no bearing on page numbers which will appear later in the final reproducible copy.

4.2.2.2 Preliminary technical manuals and final reproducible copy (see 3.2.31 and 3.2.15). The page number shall be placed as specified in 4.2.1.4.2.1. However, when all the information for a 4 by 5 112, 4 1/2 by 7, 5 1/2 by 7, 4 by 8 or 5 by 8-inch manual is placed horizontally on all pages, and all pages are arranged head to foot, the page number shall be placed in the lower right corner of all pages.

4.2.2.2.1 Blank page number. A blank page shall be assigned a number but it shall appear on the preceding or following page. For example: if page 10 of Chapter 1 is blank, page 9 shall bear the number 1-9/(1-10 blank); if page 9 of Chapter 1 is blank, page 10 shall bear the number (1-9 blank)/1-10. When applicable, an added page, such as 1-10.1, shall show that 1-10.2 is blank.

4.2.2.2.2 Pages, tables and illustrations. Pages, tables and illustrations shall be numbered consecutively within each chapter. Manuals divided into chapters and, in turn, into sections, shall contain consecutively numbered pages, tables and illustrations for the entire chapter. Page, table and illustration numbers shall consist of two part Arabic numerals separated by a hyphen. The first part shall be the chapter number with the second part being the order within the chapter. When specified (see 6.2), the volume number shall be included with the page number. For example:

Number	Meaning
#2-17	Chapter 2, Page 17
#3-12-10	Volume 3, Chapter 12, Page 10
*Table 2-17. (Title)	Chapter 2, Table 17
*Figure 2-17. (Title)	Chapter 2, Figure 17
†Figure 2-17. (Title) (Sheet 1 of 3)	Chapter 2, Figure 17 is a multisheet (3 total) illustration. Remaining sheets shall be numbered in consecutive order; (Sheet 2) (Sheet 3) and so forth.

If a chapter is so short that the chapter can be completed on one page, permitting another chapter to start on the same page, both chapter numbers shall be indicated by the page number. For example: "3-1/4-1." For numbering of blank pages, see 4.2.2.2.1.

* Note that a manual may contain both a Table and a Figure 2-17.

† Only the first sheet of a multiple sheet illustration shall contain the total number of sheets, i.e. Sheet 1 of 3.

4.2.2.2.2.1 Title pages. Title pages shall be unnumbered; however, the first page of a brief manual that uses an abbreviated title, below which the beginning text is placed, shall be assigned Arabic numeral 1. The reverse side of the title page, when used as a continuation of the title page (see 4.5.1), shall be numbered T-2.

4.2.2.2.2.2 Warning pages. Warning pages shall be numbered with lowercase letters, e.g. "a", "b", "c", etc.

4.2.2.2.2.3 List of effective pages. The list of effective pages shall be numbered using the letter "A" in the lower left-hand corner. When using a T-2 page, or when the list of effective pages otherwise begins as a right-hand page, the letter "A" shall be in the lower right-hand corner. When additional pages are required, they shall be identified as "B", "C", etc.

4.2.2.2.2.4 Verification status page. The verification status page shall be numbered VS-1. If more than one page is required, they shall be numbered consecutively, and shall indicate the total number of pages, i.e. VS-1 of 3, VS-2 of 3, VS-3 of 3.

4.2.2.2.2.5 Front matter. Front matter pages, except change record pages, following the list of effective pages and preceding chapter 1 shall be assigned sequential lower case Roman numerals, i.e. i, ii, iii, etc.

4.2.2.2.2.6 Foldout figure numbers. The figure numbers for foldouts (see 3.2.16) which fall at the end of the manual shall be "FO-1", "FO-2", etc, and shall be placed preceding the figure title under the illustration. The figure numbers for foldouts which fall at the end of a chapter or are interspersed with the text shall follow normal figure numbering sequence in accordance with 4.2.2.2.2. When a foldout consists of several sheets, the sheets shall be numbered in consecutive order following the figure title in accordance with 4.2.2.2.2.

4.2.2.2.2.7 Foldout page numbers. The page numbers for foldout pages (see 3.2.16) which fall at the end of the manual shall be FP-1/(FP-2 blank), FP-3/(FP-4 blank) etc. The page numbers for foldout pages which fall at the end of a chapter or are interspersed with the text shall follow normal page numbering sequence in accordance with 4.2.2.2.2.

4.2.2.2.3 Footnotes. Numbering of footnotes to tables shall be independent of that of footnotes to the text. Consecutive superior numbers beginning with "1" shall be used (in tables, superior lowercase letters, asterisks or other designation may be used where numbers would cause confusion). Footnote numbers and text shall be separated by two spaces. The numbering system shall be per chapter or table, as applicable.

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4.2.2.2.4 Appendix. Appendixes shall be identified by capital letters, e.g. APPENDIX A, APPENDIX B and so forth. Pages, paragraphs, illustrations and tables for appendixes shall be consecutively numbered in Arabic numerals preceded by the capital letter of the appendix. For example:

Number	Meaning
A-17	Appendix A, page 17
Figure B-17	Appendix B, figure 17
Table C-17	Appendix C, table 17

4.2.2.2.5 Glossary pages. The page numbers for an independent glossary shall be consecutively numbered in Arabic numerals with the word "Glossary" preceding the page number. For example: "Glossary 1."

4.2.2.2.6 Index pages. Unless otherwise specified (see 6.2), page numbers for indexes shall be consecutively numbered in Arabic numerals with the word "Index" preceding the page number. For example: "Index 1."

4.2.3 Headings. Numbers and titles for parts, chapters, sections, appendixes, glossaries, alphabetical indexes, etc, shall be in all capital letters centered at the top of the first page of text for each. The Section I heading shall be centered immediately below the chapter heading; subsequent section headings shall be centered on the page and precede the applicable text.

4.2.4 Foldout page and multisheet illustration limitations.

4.2.4.1 Foldout pages (see 3.2.16). Foldout pages shall be prepared only when approved by the acquiring activity (see 6.2). Multisheet illustrations should be used where possible, in lieu of foldouts, when usability will not be affected. Foldout-foldup pages are not permitted. If approved by the acquiring activity, foldout pages may be prepared for the 4 by 8, 5 1/2 by 7, 5 by 8 and 8 1/2 by 11-inch manuals. Foldout pages shall not be used in the 4 by 5 1/2, 4 1/2 by 7 or 17 by 11-inch manuals. Numbering of foldouts shall be in accordance with 4.2.2.2.2.6 and 4.2.2.2.2.7. Unless otherwise specified (see 6.2), foldouts shall meet the following requirements:

- All foldout pages shall be prepared for printing on one side only.
- Full blank aprons (see 3.1.1) shall be used.
- Foldout pages shall not be spliced.
- Foldout pages shall fall at the end of the manual. When specified, foldout pages shall fall at the end of chapters or be interspersed within text pages. When foldout pages fall at the end of the manual, such pages shall follow the last chapter, appendix or index, whichever forms the last portion.
- Maximum foldout page sizes and maximum printable area for foldout pages shall be as follows:

Manual Size	Foldout Maximum Page Size (including blank apron)	Foldout Maximum Printable Area
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4 by 8	24 by 8	#19 1/2 by 7 1/2
5 1/2 by 7	35 by 7	*28 3/4 by 6 1/4
5 by 8	31 by 8	#25 1/2 by 7 1/2
8 1/2 by 11	45 by 11	† 36 by 10

Minimum margins: 1/4-inch top, bottom and side opposite binding edge.

* Minimum margins: 1/4-inch top, 1/2-inch bottom and side opposite binding edge.

† Minimum margins: 1/2-inch top and bottom, 1/4-inch side opposite binding edge.

4.2.4.2 Multisheet illustrations. When an illustration exceeds one page but will not be prepared as a foldout, the illustration shall be divided and planned for presentation on facing pages and numbered in accordance with 4.2.2.2.2. Sheet 3, Sheet 4, etc, can be planned for succeeding pages when required and if this treatment will not affect the usefulness of the manual.

4.2.5 Emergency page markings. Pages containing emergency information shall have a broken black border in accordance with the requirements of Figure 3. FRC for emergency pages shall be 1/4-inch oversize to ensure proper printing of the bleed borders. Emergency page markings are not considered margin data.

4.2.6 Indentations. All lines on warnings, cautions and notes (see 3.2.40, 3.2.4 and 3.2.27) shall be indented five spaces or characters from both left and right margins. When the right margin is unjustified, indentations of five spaces shall be from the maximum allowable width of the typed text. Procedural steps in a paragraph structure shall be indented as described in 4.2.9.5.3. Procedural steps in other structures, e.g. in a table, shall have substeps indented two spaces. Each level of substep shall be indented an additional two spaces. When step numbers require double characters (aa., (10), (aa), etc.), the number shall be indented only one space in order to maintain right justification of the numbers. For example:

z. xxxxxxxxxxxx	(9) xxxxxxxxxxxx
aa. xxxxxxxxxxxx	(10) xxxxxxxxxxxx

4.2.7 Tables (see 4.3.9). Figures 2 and 4 provide an example of a typical table.

4.2.7.1 Table cutline (see 3.2.10). For RDC, the point at which a table or (when appropriate) chart is to be placed shall be indicated by a break in the text and the insertion of the table number and title (see Figure 5). Cutlines shall be placed at the end of the first paragraph or subparagraph to which they pertain. The table number shall begin at the left margin and there shall be a double space above and below the cutline. For the PTM or FRC, the table is mounted in place and the cutline becomes the table title.

4.2.7.2 Table titles. Tables shall be assigned table titles. The title shall follow two spaces after the table number and shall be centered above the applicable table. The first letter of the first word and of each principal word shall be capitalized. Full page tables, placed sideways on a page, shall be turned 90 degrees counterclockwise. The table number and title for a turned table shall also be turned 90 degrees counterclockwise to stay centered above the table. Table titles should begin with an identifying name. For example: "Table 3-1. Guidance System Test Points." The title shall be

short and describe the contents or purpose of the table. Tables applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example: "Table 2-3. (Army Only) Fuel Indicator Correction Factors."

4.2.7.3 Boxhead titles (see 3.2.2) and rules. Tables shall be vertically ruled as required for clarity. A horizontal rule shall be placed at the beginning (head) and at the end (foot) of a table and following column heads (boxhead titles). The closing rule is omitted at the foot of a continued table; the opening rule is omitted at the head of the continuation of the table. For preprogrammed tables, with columns ruled for continued tables, the opening rule may be included at the head of the continuation of the table. The first letter of the first word and of each principal word of boxhead titles shall be capitalized; the remaining letters shall be lowercase. Tables shall be so designed that related entries in different columns are aligned. Carry over lines shall be indented two spaces unless adequately spaced between entries.

4.2.7.4 Continued table material. When a table is continued on a following page, the number and title shall be repeated at the head of the columns on all following pages of the table, followed by a dash and the word "Continued." Boxhead titles shall also be repeated. The above information shall not be repeated on a following page when the page is a foot page of a head to foot tabular arrangement. When a table entry is continued, the entry or its identifying number or letter from the first column shall be repeated in the first column followed by a dash and the word "Continued." The abbreviation "Cont" may be used when table columns are too narrow for "Continued" to be spelled out.

4.2.7.5 Footnotes to tables. Numbering of footnotes to tables shall be in accordance with 4.2.2.2.3. The footnotes, which shall be kept to the minimum consistent with clarity, shall be placed immediately below the table in which they are referenced. If a table is continued onto other pages, all footnotes shall be placed at the bottom of the page on which they are referenced or at the end of the table and the directory note "See footnotes at end of table" shall be placed at the bottom of pages containing footnote references. For footnotes coming before the end of the table, and for a directory note, a one inch horizontal rule shall be placed flush left below the table and the footnote or directory note placed under the rule. Footnotes at the end of the table shall be started on the second line below the closing rule. All table notes and footnotes shall be indented five spaces from the left margin of the table and carry over lines shall return to the left margin of the table.

4.2.8 Illustration (see 4.3.9) placement and legends (see 3.2.23).

4.2.8.1 Illustration cutline (see 3.2.10). For RDC, the point at which an illustration or (when appropriate) chart is to be placed shall be indicated by a break in the text and the insertion of the figure number and title (see Figure 6). Cutlines shall be placed at the end of the first paragraph or subparagraph in which they are referenced, unless they require a foldout (see 4.2.4.1). The figure number shall begin at the left margin and there shall be a double space above and below the cutline. Cutlines for foldout illustrations shall be placed at the end of the text. For the PTM and FRC, the illustration is mounted in place and the cutline becomes the figure title.

4.2.8.2 Figure titles. Illustrations shall be assigned figure titles. The title shall follow two spaces after the figure number and shall be centered below the applicable illustration (except for foldout figures, see 4.2.4.1). The first letter of the first word and of each principal word shall be capitalized. Full page illustrations, placed sideways on a page, shall be turned 90 degrees counterclockwise. The figure number and title for a turned illustration shall be placed at the bottom of the page with the manual in its normal position. When the majority of illustrations are turned, the figure number and

title shall also be turned to appear below the illustration. Figure titles should begin with an identifying name. For example: "Figure 3-1. Guidance System Gyroscope Assembly." The title shall be short and describe the contents or purpose of the illustration. Illustrations applicable to one Service, in a manual that will be used by more than one Service, shall be identified. For example: "Figure 2-3. (Army Only) Fuel Indicator."

4.2.8.3 Illustration legends (see 3.2.23). Unless the legend is contained as part of the figure, legends shall be placed four spaces above the cutline (RDC) or illustration (PTM and FRC) and shall be headed by the word "Legend" followed by the number of the figure to which it is applicable (see Figure 6). The entire legend shall be indented 5 spaces. If the legend is continued, the figure number and title shall be repeated, followed by a dash and the word "Continued". Only that information which is necessary to clearly identify the items shall be included in the legend. Where methods such as the tabular presentation technique (as in an Illustrated Parts Breakdown/Repair Parts and Special Tools List) are used, no legends are required.

4.2.8.4 System/Subsystem/Subject Number (S/S/SN) numbers. S/S/SN numbers are required only for systems/equipment using the MIL-STD-1808 numbering system or when specified in the detail specification. When used, S/S/SN numbers shall be placed in the lower right-hand corner of the illustration. For contractor illustration identification numbers, see 4.6.15.

4.2.9 Divisions. The hierarchical breakdown of a publication shall be divided into volumes, parts, chapters, sections and paragraphs, as appropriate. There shall be at least two of each subdivision used, except paragraphs, i.e. where there is a Volume, Part, Chapter 1 or Section I, there shall be a Volume, Part, Chapter 2 or Section II. All volumes, parts, chapters, sections and primary and first subordinate paragraphs shall be titled except procedural steps or those statements which follow a colon. The second and all following subparagraph lines shall begin at the left margin. Breakout shall be planned so as to subordinate that which should be subordinated. For example:

2.7 NONREVERSIBLE VALVE.

2.7.1 Removal. The following steps describe removal of the nonreversible valve (Figure 2-2).

- a. Remove safety wire from J1, J2 and J3 and remove connectors.
- b. Remove four nuts (16), washers (17) and bolts (18) securing valve (1) to mount (20) and remove from mount.

2.7.2 Disassembly. The following steps describe disassembly of the nonreversible valve (Figure 2-3).

- a. Remove safety wire from locking ring (27) and unscrew locking ring from body (2).
- b. Remove spring (3) and plate (4) from body (2).

2.7.3 Assembly. The following steps describe assembly of the nonreversible valve (Figure 2-3).

- a. Install spring (3) and plate (4) in body (2).
- b. Screw locking ring (27) into body (2) and safety wire.

2.7.3 Adjustment. The following steps describe adjustment of the nonreversible valve (Figure 2-4).

- a. Using special tool, part no. 12345, apply 12 pounds of pressure to plate (4).
- b. Adjust break point screw (11) until plate (4) seats against body.

4.2.9.1 Volumes (see 3.2.39). Unless otherwise specified (see 6.2) volumes shall be used and numbered consecutively in Arabic numerals. When authorized, volumes shall be used when a publication exceeds 1500 printed pages (750 sheets). Two or more volumes shall be identified sequentially by volume numbers and subtitles indicative of volume content and have a unique Technical Manual Identification Number System (TMINS) number assigned as provided by the acquiring activity. Volumes shall be separated by complete chapters, where possible. (A) Separate volumes shall not be used to distinguish between models, i.e. -10 for basic model, -10-1 for model A, -10-2 for model B, etc.

4.2.9.2 Parts (see 3.2.28). (N) When a volume exceeds approximately three inches in thickness, it shall be divided by complete chapters (where possible) into separately bound parts. Each part shall be numbered consecutively in Arabic numerals. Each part shall be identified by both its volume and part numbers and have a unique TMINS number assigned as provided by the acquiring activity.

4.2.9.3 Chapters (see 3.2.7). Arabic numerals shall be used to number chapters consecutively throughout all volumes of the publication. Chapters shall begin on a right-hand page. Format shall be as shown in Figure 2.

4.2.9.4 Sections (see 3.2.34). Roman numerals shall be used to number sections consecutively within each chapter. Format shall be as shown in Figure 2.

4.2.9.5 Paragraphs. Text shall be divided into primary paragraphs and subordinate paragraphs. Paragraphs may also be divided into procedural steps. Procedural steps may be further divided if necessary. Decimal paragraph numbering as described in 4.2.9.5.2 shall be used.

4.2.9.5.1 Paragraph headings. Paragraph headings (titles) are identified as primary sideheads, first subordinate sideheads, second subordinate sideheads, etc. Periods shall follow paragraph titles. There shall be two spaces between the paragraph number and the title.

4.2.9.5.1.1 Primary sideheads. Primary sideheads divide text within chapters or sections into two or more portions. There shall be at least one primary sidehead in each chapter or section. Primary sideheads stand alone (are not run in with text) and shall appear in capital letters. They shall begin at the left margin and shall be underscored.

4.2.9.5.1.2 Subordinate paragraphs. Subordinate paragraphs shall be numbered. First subordinate paragraphs shall have a sidehead. Second and subsequent subordinate paragraphs should, but are not required to, have a sidehead. The first letter of the first word and of each principal word shall be capitalized, and the title shall be underscored. The text shall begin on the same line as the title/paragraph number and be separated by a period (if using a title) and two spaces. Carry over lines for all subordinate paragraphs shall return to the left margin. Breakdowns beyond the third subordinate shall not be used without the approval of the acquiring activity. Figure 7 shows samples of decimal paragraph numbering and decimal paragraph numbering with added material. Single column format shall use the same conventions as double column.

4.2.9.5.2 Decimal paragraph numbering. Format for the decimal numbering method shall be as outlined below and in Figure 7. Paragraphs shall be numbered consecutively within the chapter. All paragraph numbers shall be preceded by the chapter number and a period.

- a. Primary sideheads shall be numbered consecutively within the chapter. The paragraph number shall be preceded by the chapter number and a period, e.g. the first primary paragraph of Chapter 3 would be 3.1, the second primary paragraph would be 3.2, etc.
- b. All subordinate sideheads shall begin two spaces below the preceding paragraph at the left margin.
- c. Procedural steps shall begin two spaces below the preceding text and indented two spaces from the left margin. Substeps shall begin two spaces below the preceding step and indented an additional two spaces.

4.2.9.5.3 Procedural steps. Procedural steps shall be used to provide step-by-step instructions, such as disassembly, assembly and alignment procedures. Steps may be further divided into substeps. Procedural steps and checklist items shall be numbered in accordance with 4.2.9.5.2. See Figure 7. The text shall begin on the same line as the step number and be separated by two spaces. Carry over lines shall not return to the left margin but shall start under the first letter of the preceding line (blocked).

4.2.9.6 Appendixes. Appendixes shall immediately follow the last chapter of the manual. Appendixes shall begin on a right-hand page. Pages, paragraphs, illustrations and tables for appendixes shall be numbered in accordance with 4.2.2.2.4. Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own appendixes. In addition, Volume 1 or the first manual of the set shall contain appendixes for all volumes or manuals in the set.

4.2.9.7 Glossaries. Glossaries shall be used in TMs only when the terms are not adequately defined in the text, in the Army, Navy, Air Force, DOD or standard dictionary, or contained in the manual foreword/preface/introduction. If a glossary is required, it shall immediately precede the alphabetical index, if any. Page numbers for a glossary shall be consecutively numbered as specified in 4.2.2.2.5. Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own glossary. In addition, Volume 1 or the first manual of the set shall contain a glossary for all volumes or manuals in the set.

4.2.9.8 Index Unless otherwise specified (see 6.2), an alphabetical index shall be prepared when the number titled paragraphs in a publication exceeds 100 (see Figure 8). When specified, an index shall be prepared regardless of the number of paragraphs. It shall list pertinent subjects

under every topic for which users are likely to look. "See" and "see also" references may be included to guide the user to other pertinent entries. All applicable paragraph numbers for each item shall be indicated. The alphabetical index shall be so constructed as to enable the user to easily locate any part, information or operation described in the text. Alphabetical indexes shall begin on a right hand page. Page numbers for alphabetical indexes shall be consecutively numbered as specified in 4.2.2.2.6. The alphabetical index shall be located at the end of the publication but will be located before foldout page(s). Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own index. In addition, Volume 1 or the first manual of the set shall contain an index for all volumes or manuals in the set.

4.3 Style of writing. Style of writing shall ensure:

- a. Technical content shall be presented in language free of vague and ambiguous terms, using the simplest words and phrases which will convey the intended meaning. The U.S. Government Printing Office Style Manual shall be used as a general guide for capitalization, punctuation, compounding of words, numerals in the text and spelling of nontechnical words. All essential information shall be included, either by direct statements or by reference. Sentences shall be short and concise. Punctuation shall be used in a manner which aids in reading and prevents misreading. Sentences shall be rewritten when extensive punctuation is necessary for clarity. Technical words shall be used only when no other wording will convey the intended meaning.
- b. For maximum clarity and usefulness, there shall be consistency in terminology and organization within the same publication or series of publications. Nomenclature shall be consistent within a publication and throughout parts lists, parts breakdowns and other directly related publications.
- c. Quotation marks and underscoring shall not be used for emphasis.
- d. Words which have more than one meaning which will fit the context in which they are used, such as "replace" for "reinstall," shall not be used.
- e. Chapter, section and paragraph headings shall be descriptive of the contents of the division they head; "General" and "Miscellaneous" shall not be used unless no other title will suffice.
- f. Statements which explain applicability for individual items of equipment shall use specific serial number(s), block designation(s), specific model designation(s) or similar identification. Such terms as "on later equipment" and "on early serial numbers" shall not be used.
- g. Technical publications shall make no reference to age, sex, race or national origin. Use sex neutral terms, except avoid use of the word "person" (terms such as "midshipman" and "workman" are considered sex neutral). Terms such as male and female connectors, pins, etc, are acceptable.

4.3.1 References. The text shall refer to:

- a. Only models or types covered by the manual. To facilitate coverage of modified or additional models or types at a later date, references should be held to a minimum consistent with clarity.

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- b. The basic number of Government specifications and standards. When the contractor cannot ascertain the Government specification number, the contractor shall request this information from the acquiring activity, furnishing complete information concerning the material's composition, properties, characteristics, applications, manufacturer's specification number, etc.
- c. Temperature readings as calibrated on the equipment. If other than Fahrenheit, the equivalent in Fahrenheit shall follow in parentheses. General temperature references, such as room temperature, shall normally be given in degrees Fahrenheit.
- d. Speed, distance and other instrument readings as calibrated on the equipment.
- e. Switch positions and panel markings exactly as marked on the equipment. However, symbols on panel markings may be spelled out when they cannot be produced by the composing equipment used to prepare the PTM or FRC, such as the symbol for "ohm", "infinity", etc.
- f. Measurements in U.S. standard units (ounces, pounds, gallons, inches, feet, knots, miles, etc.) except instances in which metric measurements are required. When the metric system is used on the equipment, conversion to U.S. standards shall follow in parentheses. If the detail specification so requires, conversion of U.S. measurements to metric measurements shall be indicated.
- g. Illustrations by figure number, including section letter/number when applicable, and the sheet number for multisheet illustrations, when applicable. References shall be made only to illustrations within the same manual or another volume of the same manual.
- h. Figure numbers first, followed by the index number (see 3.2.18). For example: "(Figure 2-6, 34)." However, when multiple references in a paragraph refer to the same figure, only the first reference need indicate the figure number. For an example, see sample following 4.2.9. When the sequence is unbroken for procedures requiring two or more pages, the figure number followed by a dash and the word "Continued" shall be repeated after the first reference on each succeeding page. If two or more figures are involved in the same sequence, the figure with the greater number of items shall be cited as described above. Index callouts (see 3.2.3 and 3.2.18) for items on remaining figures shall have the index number follow the figure number, e.g. "(Figure 3-5, 21)." In such cases, the paragraph lead-in shall contain a statement similar to the following: "Item numbers below refer to Figure 3-4 unless otherwise indicated."
- i. Parts on diagrams by enough of their reference designation to identify the item. For example: Resistor A6R11.
- j. Tables by table number. Reference shall be made only to tables within the same manual or another volume of the same manual.
- k. Other supporting paragraphs in the same manual or another volume of the same manual, by exact paragraph title (without the paragraph number) in capital letters, followed by the volume/part/chapter/section number in parentheses.
- l. Other subordinate paragraphs of the same primary paragraph as "above" or "below."

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- m. Other TM identification numbers including exact paragraph title, when applicable, but omitting dates, page, figure and paragraph numbers. Reference may be made only to publications in the publication system(s) of the Service(s) that will use the publications and are authorized at user level.
- n. Footnotes, when essential for reference, explanation, comments, etc. Numbering of footnotes shall be in accordance with 4.2.2.2.3. Identical footnotes shall not be repeated within the chapter. Footnotes in the text shall not be used for mandatory requirements. Footnotes to the text shall be placed at the bottom of the page with a one inch horizontal rule placed flush left two spaces below the text and the footnote placed under the rule. For footnotes to tables, see 4.2.7.5.
- o. Series of items as follows:
 - (1) By following the basic number with “-series” when all numbers in the series are included. For example: “TO 00-20-series” includes all TM identification numbers beginning with 00-20.
 - (2) By following the basic number with “series” (without dash) when the basic number is immediately followed by a letter or is succeeding a higher number. For example: AFTO Form 781 series could include AFTO Forms 781A, 781K, etc; DD Form 1570 series could include DD Forms 1571, 1575, 1577, etc.
- p. When a reference applies only to one sentence, it shall be enclosed in parenthesis and placed at the end of the sentence with the period outside the parenthesis. For example: “...which will be used for this purpose (Figures 2-9 and 2-10).” When a reference applies to the entire paragraph it shall be enclosed in parenthesis and placed after the paragraph title. For example: “5.3 Inspection Requirements. (Figure 3-2) Inspection shall be system.” When a reference applies to the entire paragraph, but the paragraph has no title, it shall be enclosed in parenthesis outside the sentence. For example: “...technical data change request. (TO 00-5-1).”

4.3.1.1 Duplication of material. Duplication of material within a manual shall be avoided by referencing unless required for clarity or emphasis. To avoid duplication of more than two pages, other manuals shall be referenced in accordance with 4.3.1.m. Except for classified material, cross referencing is prohibited when material of two pages or less is involved.

4.3.2 Grammatical person and mood. The second person imperative mood shall be used for procedures, i.e. “Remove test set from carrying case.” Third person indicative mood shall be used for description and discussion, i.e. “When switch A is in the ON position, lamp (34) lights.”

4.3.3 Readability. Unless otherwise specified (see 6.2), the Reading Grade Level (RGL) shall be nine. Technical publications shall be written to the capability of the target audience for which they are intended.

4.3.4 Abbreviations/acronyms. Use of abbreviations/acronyms shall be held to a minimum and each shall be spelled out the first time it appears in each chapter, section, part, job guide, work package or other division where confusion may exist or usability would be enhanced. An excellent rule to follow is; “when in doubt, spell it out.” Abbreviations/acronyms which are accepted as words (radar, sonar, laser, etc.) need not be spelled out. When a phrase is being abbreviated/ acronymed, the first

letter of each word shall be capitalized and elements shall not be separated by periods. For example: Offensive Avionics System (OAS). Abbreviations/acronyms used shall be in accordance with the requirements of MIL-STD-12, except that abbreviations may be plural (s) or possessive ('s) after the first use. If a manual is prepared on composing equipment which cannot produce a certain abbreviation or symbol, such as "±" for "plus or minus", a substitute symbol, such as "+/-" or "+ or -", or an abbreviation, such as "POM", may be used. New abbreviations/acronyms shall not be created for words or terms that already have abbreviations/acronyms established in MIL-STD-12. All abbreviations/acronyms used in the manual shall be explained in the manual's foreword/preface/introduction.

4.3.5 Metric symbols. Metric symbols shall be in accordance with ASTM E380-86 and IEEE 945-84.

4.3.6 Military terms. Military terms used shall be in accordance with Joint Chiefs of Staff (JCS) Pub. 1 or any dictionary or glossary of military terms of the appropriate Service.

4.3.7 Automatic electronic test and checkout terminology. Terms used for automatic electronic test and checkout shall be in accordance with MIL-STD-1309.

4.3.8 Use of "shall", "will", "should" and "may". Use "shall" whenever a manual expresses a provision that is binding. Use "should" and "may" whenever it is necessary to express nonmandatory provisions. "Will" may be used to express a declaration of purpose. It may be necessary to use "will" in cases where simple futurity is required, e.g. "Power for the meter will be supplied by the ship."

4.3.9 Tables, charts and graphs. Reference data (other than illustrations, drawings, diagrams) shall be presented in tabular, chart or graph form. Any other type of data which lends itself to tabular, chart or graph form may also be so presented. Tables, charts and graphs shall be so designed that they are easily understood. Charts shall be presented as tables or illustrations, whichever is most appropriate. Graphs shall be considered illustrations, and be assigned figure numbers.

4.3.9.1 Tabular material. When a small amount of tabular information is to be inserted, and will not require referencing from adjacent text, it may be included within a paragraph of text without identifying it as a table.

4.3.10 Warnings, cautions and notes (see 3.2.40, 3.2.4 and 3.2.27). Unless otherwise specified (see 6.2) warnings and cautions for primary sidehead paragraphs shall precede the text but follow the paragraph headings to which they apply. For all subordinate sideheads and procedural steps, the warning or caution shall precede the paragraph or step. Notes may precede or follow applicable text, depending upon the material to be highlighted. Warnings, cautions and notes shall not contain procedural steps nor shall the headings be numbered. When a warning, caution or note consists of two or more paragraphs the heading WARNING, CAUTION, NOTE shall not be repeated above each paragraph. If it is necessary to precede a paragraph by both a warning and a note, or a caution and a note, etc, warnings shall precede cautions, which in turn shall precede notes. Figure 9 illustrates the styles. Warnings, cautions and notes shall be short, concise and used only to emphasize important or critical data. Warnings and cautions may be worded positively or negatively and shall state the hazard and result or reason, unless obvious. Appendix A of this standard provides additional guidance for inclusion of warnings and cautions.

4.3.10.1 Health hazards. Procedures prescribed for the operation of equipment shall be consistent with the safety standards established by the Occupational Safety and Health Act (OSHA) Public Law 91-596 and Executive Order 12196. When exposure to hazardous chemicals or other adverse health factors or use of equipment cannot be eliminated, guidance pertaining to the exposure shall be included in the Safety Summary or a Warning. A list of personnel protective devices shall be included. Appendix A provides additional guidance for inclusion of warnings. Unless otherwise specified (see 6.2), icons (see 3.2.17) shall be used as described in Appendix A. (F) The safety and health requirements of Air Force Occupational Safety and Health (AFOSH) Standards shall also be complied with.

4.3.10.2 Nuclear Surety. Nuclear weapon or weapon system technical publication procedures containing operations, maintenance, troubleshooting, OPCERT, handling, movement, restraint configuration, loading, testing and delivery required certification for nuclear safety. The primary consideration for nuclear weapon systems is to ensure that the system is safe and weapons are not subjected to inadvertent power application, control signals, or used for troubleshooting. If nuclear weapon or weapon system technical publication procedures require nuclear safety certification, applicable cautions shall be incorporated into technical publications to ensure that safety is not degraded during operation and maintenance.

4.3.10.2.1 Nuclear surety procedure symbol. Unless otherwise specified (see 6.2), all Nuclear Surety Procedures (NSP) shall be marked with the symbol m When approved by the acquiring activity, the symbol **NSP** may be used in lieu of the box NSP symbol. The symbol shall be prepared in the same style and size as the applicable paragraph sidehead. The symbol shall not be included in the paragraph title in the table of contents. Use of the symbol is as follows:

- a. When the entire manual is nuclear safety certified, the symbol shall be inserted immediately following the title of the manual on the title page (e.g. WEAPON LOADING PROCEDURES NSP)
- b. When the entire chapter, section and all subordinate paragraphs/steps relate to Nuclear surety procedures, the symbol shall be inserted immediately following the chapter or section title or immediately following the paragraph number (e.g. PYLON LOADING NSP or "1.2 NSP LOADING OPERATIONS").
- c. When all subordinate paragraphs and steps do not contribute to establishing nuclear surety, only those which do contribute will be annotated with the symbol.

4.3.10.2.2 Nuclear surety procedures symbol explanation. When applicable, the foreword/preface/introduction shall include the symbol and an explanation of the NSP symbol and other pertinent information as necessary to emphasize the uniqueness of nuclear surety. This shall include an explanation that all manuals, chapters, sections, paragraphs, procedures and steps identified by the symbol must be followed as written to ensure nuclear surety is not degraded. This explanation shall be preceded by a CAUTION heading.

4.3.10.3 Nuclear hardness. If equipment to be operated, maintained or overhauled has nuclear survivability requirements (i.e. Over Pressure and Burst, Thermal Radiation, Electromagnetic Pulse or Transient Radiation Effects on Electronics), applicable cautions shall be incorporated into technical publications to ensure that hardness of equipment is not degraded during operation and maintenance.


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4.3.10.3.1 Nuclear hardness symbol. Unless otherwise specified (see 6.2), all Hardness Critical Processes (HCP) shall be marked with the symbol HCP. When approved by the acquiring activity, the symbol **HCP** may be used in lieu of the boxed HCP symbol. The symbol shall be prepared in the same style and size as the applicable paragraph sidehead. The symbol shall not be included in the paragraph title in the table of contents. Use of the symbol is as follows:

- a. When the entire procedure and all subordinate paragraphs/ steps relate to establishing nuclear hardness, the symbol shall be inserted immediately following the paragraph number (e.g. "1.2 HCP LRU REPAIR").
- b. When all subordinate paragraphs and steps do not contribute to establishing nuclear hardness, only those which do contribute will be annotated with the symbol.
- c. Maintenance actions which could degrade hardness, but which are not directly involved in establishing nuclear hardness, will not be annotated with the symbol, but will be preceded by a caution.

4.3.10.3.2 Nuclear hardness symbol explanation. When applicable, the foreword/preface/ introduction shall include the symbol and an explanation of the HCP symbol and other pertinent information as necessary to emphasize the uniqueness of hardness features. This shall include an explanation that all paragraphs, procedures and steps identified by the symbol must be followed as written to ensure nuclear hardness is not degraded. This explanation shall be preceded by a CAUTION heading.

4.3.10.4 Electrostatic Discharge Sensitive (ESDS) parts. If equipment to be handled/maintained contains ESDS parts, components or circuits, applicable cautions and symbols shall be incorporated into technical publications to ensure ESDS parts are not damaged or degraded during handling/maintenance.

4.3.10.4.1 ESDS symbol. Unless otherwise specified (see 6.2), all paragraphs which address handling or maintenance which could damage ESDS parts shall be identified by the ESDS symbol . When approved by the acquiring activity, the symbol **ESD** may be used in lieu of the ESDS symbol. The symbol shall be prepared in the same style and size as the applicable paragraph sidehead. The symbol shall not be included in the paragraph title in the table of contents. Use of the symbol is as follows:

- a. When the entire procedure and all subordinate paragraphs/steps describe handling/maintenance which could damage ESDS parts, the ESDS symbol shall be inserted immediately following the paragraph number (e.g. "1.2  LRU REPAIR").
- b. When all subordinate paragraph and steps are not related to handling/maintenance which could damage ESDS parts, only those related will be annotated.
- c. Maintenance actions which could damage ESDS parts, but which are not directly related to handling/maintenance of ESDS parts, will not be annotated with the ESDS symbol, but will be preceded by a caution.
- d. Illustrations, drawings and schematic shall be marked with the ESDS symbol.

4.3.10.4.2 ESDS symbol explanation. When applicable, the foreword/preface/introduction shall include the symbol and an explanation of the ESDS symbol. Other pertinent information shall be included as necessary to emphasize the uniqueness of ESDS parts. This will include an explanation that the ESDS symbol requires that all ESDS parts be handled according to ESDS device handling procedures. This explanation shall be preceded by a CAUTION heading. (F) The foreword shall refer to "ESDS device handling procedures in TO 00-25-234."

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4.3.10.5 Fatigue and fracture critical parts. If equipment to be maintained contains Fracture Critical Parts (FCP), applicable cautions and symbols shall be included to ensure these parts are not damaged or degraded during handling and maintenance.

4.3.10.5.1 FCP symbol. Unless otherwise specified ((F), see 6.2), all fatigue and fracture critical parts shall be marked with the FCP symbol. When approved by the acquiring activity, the symbol **FCP** may be used in lieu of the boxed symbol. The symbol shall be prepared in the same style and size as the applicable paragraph sidehead. The symbol shall not be included in the paragraph title in the table of contents.

4.3.10.5.2 FCP symbol explanation. When applicable, the foreword, preface, or introduction shall include the symbol and an explanation. Insert notes of caution regarding the temporary relocation, storage, removal, installation, inspection, and handling procedures for FCPs.

4.3.10.6 Observable criticality. If equipment to be operated, or maintained has observability critical requirements, e.g., radar cross-section/signature, applicable cautions shall be incorporated to ensure that equipment is not degraded during operation and maintenance.

4.3.10.6.1 Observable criticality. Unless otherwise specified (see 6.2), all observable critical items (OCI) and observable critical processes (OCP) shall be marked with the symbol OCI or OCP as applicable. When approved by the acquiring activity, the symbols **OCI** and **OCP** may be used in lieu of the boxed symbol. The symbol shall be prepared in the same style and size as the applicable paragraph sidehead. Only the text version of the symbol shall be used in the applicable table of contents paragraph title.

4.3.10.6.2 Observable critical symbol explanation. When applicable, the foreword, preface, or introduction shall include the symbol, an explanation of the symbol, and other pertinent information to emphasize the uniqueness of observable critical features. This shall include an explanation that all paragraphs, procedures, items, and steps identified by the OCI or OCP symbols must be followed as written or components handled in such a manner that ensure surface integrity is not degraded. This explanation shall be preceded by a CAUTION heading.

4.3.11 Energy efficiency requirements. When specified (see 6.2), TMs covering products that directly consume energy in normal operations, and that commonly have a method of expressing energy efficiency, shall include their energy efficiency.

4.3.12 Environmental protection. All TMs that require the use, transportation, handling, storage or disposal of fuels, toxic and hazardous substances, chemicals, ordnance/munitions, etc, shall meet the requirements of the Federal Environmental Protection Standards.

4.4 Security classification markings. The overall classification assigned to a TM shall agree with the highest classification assigned to any portion within and shall be placed conspicuously at the top and bottom of the Cover/Title page or abbreviated title. Security classification markings shall be in accordance with DOD 5220.22-M and 5200.1-R and shall be placed in accordance with 4.2.1.4.1.1, 4.2.1.4.2.4, DOD 5220.22-M and 5200.1-R.

4.5 Front matter. Unless otherwise specified (see 6.2), material preceding the first chapter shall consist of the following in the order specified:

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MATERIAL	ARMY	NAVY	AIR FORCE	MARINE CORPS
Cover/Title Page or Abbreviated Title (as applicable)	X	X	X	X
T-2 Page (as applicable)			X	
Warning Page	X			X
List of Effective Pages		X	X	X
Verification Status Page			X	
Change Record		X		X
Table of Contents	X	X	X	X
List of Illustrations		X	X	X
List of Tables		X	X	X
Foreword/Preface/Introduction	X	X	X	X
Safety Summary (as applicable)	X	X	X	X

4.5.1 Cover/Title Page. Manuals shall have either a cover or title page, or an abbreviated title. When specified (see 6.2), there shall be a cover and title page. The cover/title page shall contain the information indicated by Figure 1. Figure 1 also lists the requirements for abbreviated titles. Abbreviated titles shall be used only when specified (see 6.2). Unless otherwise specified (see 6.2), if there is both a cover and title page, the date shall be omitted from the cover page. When specified (see 6.2), a manual shall require a backbone for binder or cover. FRC for the backbone or cover of a manual shall be in accordance with Figure 10. The TM identification number will be furnished by the acquiring activity. When specified (see 6.2), certain information such as the supersedure notice, supplement notice, disclosure notice and destruction notice, as applicable, may be placed on the reverse side of the title page if additional space is needed to avoid overcrowding of the title page (i.e. small TMs such as Job Guides and Work Cards) (see Figure 11). The reverse side of the title page, when used as a continuation of the title page, shall be numbered as described in 4.2.2.2.2.1. The T-2 page shall be used only if absolutely necessary when reduced type size and leading will not allow all information to be presented on the title page. When a T-2 page is used, a statement shall be placed on the title page indicating which information has been moved to the T-2 page.

4.5.1.1 Preliminary technical manuals (see 3.2.31). When applicable, the word "PRELIMINARY" shall be centered above the words "TECHNICAL MANUAL" (or type of publication).

4.5.1.2 Review draft copies (see 3.2.32). When specified (see 6.2), the words "Draft" or "Final Draft" shall be centered above the words "TECHNICAL MANUAL."

4.5.1.3 Title. The TM title as indicated by the applicable detail specification shall consist of the following, located as shown in Figure 1.

- a. WARNING (if the manual contains unverified data).
- b. Heading "TECHNICAL MANUAL".
- c. Type of Manual.
- d. Maintenance Level (if restrictive).

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- e. Prime title (name/nomenclature).
- f. Subtitle (as applicable).
- g. Manufacturer.

4.5.1.3.1 Title warning. When specified (see 6.2), a manual containing unverified data shall have the following warning centered above the heading TECHNICAL MANUAL:

WARNING

This manual contains unverified procedures. Refer to the Verification Status Page(s) prior to performing any operation or maintenance procedures.

4.5.1.3.2 Type of manual. The type of manual (e.g. operation instructions, illustrated parts breakdown/repair parts and special tools list, maintenance instructions, etc.) shall be placed beneath the "TECHNICAL MANUAL" heading.

4.5.1.3.3 Maintenance level(s). The level(s) of maintenance, as appropriate, shall be placed beneath the manual type. (F) (N) When only one maintenance manual is being acquired to support a weapon, equipment or hardware, no level shall be specified unless restrictive, since it will be the only manual available for repair and maintenance at any designated maintenance level (Organizational, Intermediate or Depot).

4.5.1.3.4 Prime title. The nomenclature of the equipment, type/type designation, model, part number or subject (blocks, serial numbers or registration numbers, if appropriate) shall be positioned below the words identifying the manual type or maintenance level, if applicable. When specified (see 6.2), the national stock number and identification of other equipment covered in the manual shall be indicated. The classification of the equipment nomenclature shall be indicated (U), (C), (S), as specified in DOD 5220.22-M if the publication itself is classified. The prime title shall be the same on all volumes and parts of a multi-volume/part TM set (see 3.2.25 and 3.2.35).

4.5.1.3.5 Subtitle. A subtitle shall be used and located immediately below the prime title to indicate the contents of every separately bound volume and part of a TM.

4.5.1.3.6 Manufacturer. Unless otherwise specified (see 6.2), the identification of the manufacturer of the equipment shall appear below the equipment nomenclature or subtitle, as applicable.

4.5.1.4 Contract number. Unless otherwise specified (see 6.2), the original contract number for the equipment shall be placed on all new issues and carried forward on all subsequent cover/title pages. If the contract number for a change or revision is different from the original number, the number applicable to the change or revision shall be indicated on the cover/title page in addition to the original number. No more than two contract numbers, the original and the latest, need appear.

4.5.1.5 Seal. (N) The Department of the Navy Seal, with command identifier, is placed below the contract number(s).

4.5.1.6 Supersedure notice. Unless otherwise specified (see 6.2), the supersedure notice shall be placed on the title page when the manual/change/ revision/Rapid Action Change (RAC) under preparation supersedes all or portions of other manuals/changes/revisions. When specified (see 6.2), the supersedure notice shall include a list of all currently superseded supplements and RACs. Superseded supplements/RACs shall normally be listed individually, but when several alphabetically/ numerically sequenced supplements/RACs are superseded, they shall be grouped. When specified, FRC that supersedes a PTM shall include the supersedure notice. The applicable portions of the following supersedure notice shall be used:

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This (manual/change/revision/RAC) supersedes (applicable manual/change/revision number or portions of) dated (date of superseded document), Change (change number) dated (change date), including (superseded supplement/RAC numbers).

4.5.1.7 Supplement notice. (F) (M) (N) A supplement notice is used to show dependent and supporting publications when one cannot be used without the other. They apply to supplements, supplemental or partial manuals and basic manuals. Dependency is shown by such statements as "INCOMPLETE WITHOUT TO XX-XX-XX" or "USE WITH TO XX-XX-XX". Supporting publications are depicted by such statements as "THIS PUBLICATION SUPPLEMENTS TO XX-XX-XX". Cross-reference notes to supplements, or to augmented manuals, shall be placed on the cover/title page initially, or at time of change or revision.

4.5.1.8 Effective date notice. (F) When a manual or change becomes effective later than the date upon which it is distributed, a notice similar to the following shall be placed on the title page immediately after or in place of the supersession notice.

The effective date of this (publication, change) is (effective date). Instructions herein shall not be used prior to that date.

4.5.1.9 Volume notice. When specified (see 6.2), the cover/title page of each volume (see 3.2.39) shall contain a statement that the applicable volume is incomplete without the other volumes in the set (see 3.2.25 and 3.2.35).

4.5.1.10 Disclosure notice. When specified (see 6.2), the following disclosure notice shall be placed on the cover/title page of classified and unclassified manuals, except those with Distribution Statement A:

This information is furnished upon the condition that it will not be released to another nation without the specific authority of the Department of the (appropriate Service or agency) of the United States, that it will be used for military purposes only, that individual or corporate rights originating in the information, whether patented or not, will be respected, that the recipient will report promptly to the United States, any known or suspected compromise, and that the information will be provided substantially the same degree of security afforded it by the Department of Defense of the United States. Also, regardless of any other markings on the document, it will not be downgraded or declassified without written approval of the originating United States agency.

4.5.1.11 Distribution statement. All TMs shall have a distribution statement placed on the cover/title page (not T-2). The appropriate distribution statement, selected from MIL-STD-1806, will be provided by the acquiring activity (see 6.2). Selection of the statement shall be in accordance with the provisions of MIL-STD-1806. Unless otherwise specified (see 6.2), Distribution Statement C shall be placed on the cover/title page of each manual, manual supplement, manual revision or change.

4.5.1.12 Export control notice. When required by the provisions of MIL-STD-1806 (see 6.2), an Export Control Notice shall be placed on the cover/title page (not T-2) of each manual, manual supplement, revision or change.

4.5.1.13 Destruction notice. All classified technical documents shall be marked with a destruction notice from DOD 5200.1-R on the cover/title or T-2 page. All unclassified technical documents with distribution statements B, C, D, E, F or X shall be marked with the following destruction notice on the cover/title or T-2 page.

HANDLING AND DESTRUCTION NOTICE - Comply with distribution statement and destroy by any method that will prevent disclosure of contents or reconstruction of the document.

4.5.1.14 Copyright credit line. If required (see 4.1.2), the copyright credit line shall be included on the cover/title or T-2 page.

4.5.1.15 Authority notice. The authority notice will be provided by the acquiring activity (see 6.2). Manuals to be jointly used shall show a joint authority notice.

4.5.1.16 Publication date. The publication date of the manual shall be the cutoff date from which no further changes to the manual are permitted without issuing a formal change. This is normally the "approved date", that is, the date the government accepts the manual subject to the inclusion of specified comments. If the acquiring activity does not advise the contractor the exact date to use, the publication date shall be the date at which the last material to be included was received (copy freeze date [see 3.2.9]). The day, month, and year shall be given in that sequence. For example: "7 JULY 1988."

4.5.1.17 Change number (or letter) and date. See 4.7.3.1 for numbering of changes. The change number and date shall be placed on the cover/title page as follows: "CHANGE 1 10 OCTOBER 1989" or "CHANGE A 10 OCTOBER 1989".

4.5.2 Warning page. (A) (M) When specified (see 6.2), a warning page(s) shall include each general type of warning (see 3.2.40) and warning symbol used within the TM. This page(s) shall not be a list of specific warnings that pertain to particular procedural steps, but shall include general subject data (e.g. radiation, chemicals, voltage, gas pressure, laser light, etc.) as shown in the examples in Figure 12. The warning page shall be placed on the inside front cover or be the initial page(s) of the manual. These pages shall be numbered in accordance with 4.2.2.2.2.2.

4.5.3 List of effective pages. A List of Effective Pages shall be prepared in accordance with Figure 13. The list of effective pages shall back up the title page and be numbered as specified in 4.2.2.2.2.3. When using a T-2 page, and for Marine Corps, this shall be a right hand page. When the last page is a right hand page, it shall not be backed up and will list the next succeeding page as blank, e.g. "B/(C blank)". The list of effective pages shall be a complete list of all manual pages, including title page, T-2 page (if used), the list of effective pages, verification status pages, table of contents pages, safety summary pages, blank pages, deleted pages, added pages and foldout pages. The list of effective pages shall include a statement of the total number of pages in the manual. The list of effective pages shall be updated for each change or revision. The listing shall be held to a minimum by grouping numbers where applicable. The page numbers for a blank page and the printed side of the sheet shall be listed as separate numbers even though a double number will appear on the printed side of the sheet. Appropriate change numbers shall be placed in the "Change No." column. The words "Deleted" or "Blank" shall be placed along side the page number of pages so affected.

4.5.3.1 Identifying change numbers and dates. On the list of effective pages, above the listing of pages contained in the manual, shall be a list of applicable change numbers and dates.

4.5.3.2 Acquiring Service identification. The abbreviation of the acquiring Service, e.g. USAF, shall be placed in the lower right corner of the list of effective pages (page "A" only). If a Service acquires a manual for exclusive use of another Service, the symbol in the lower right-hand corner of the page shall still show the abbreviation of the acquiring Service.

4.5.3.3 List of effective pages for multivolume manuals (see 3.2.25). A list of effective pages covering all volumes shall be prepared for the basic manual and shall be included in Volume 1. In a multivolume manual, each of the volumes, except Volume 1, shall include the listing of pages provided in that particular volume.

4.5.4 Verification status page. When specified (see 6.2) all PTM/TMs exceeding eight pages which contain unverified data shall have a temporary verification status page(s) (see Figure 14). Contractor format and/or additional columns may be used, if approved by the acquiring activity (see 6.2). Upon completion of all verification, this page(s) shall be removed. This page(s) shall immediately follow the list of effective pages as the next right-hand page and shall be numbered as specified in 4.2.2.2.4.

- a. The following warning shall be placed at the top center of each verification status page:



This manual contains unverified procedures. Unverified procedures shall only be performed during verification, in accordance with TOs 00-5-1 and 00-5-3. Performance of unverified procedures can result in injury to personnel or damage to equipment.

- b. Verification status pages may be in contractor format but shall be tabular and include the TM identification number and date, change number and date, and TM management agency in the heading. Columns shall include the paragraph/function/procedure number, verification status, date verified and remarks. When specified, additional columns may be included.

4.5.5 Change record. Unless otherwise specified (see 6.2), a change record, when included, shall be prepared in accordance with Figure 15, and shall be included in each separate volume. The change record should not back or be backed up. These pages shall not be numbered.

4.5.6 Table of contents. A table of contents listing parts, chapters, sections and paragraphs in the same order and with the exact titles used in the text, with page number, shall be placed at the beginning of each publication. In publications containing alphabetical indexes (see 4.2.9.8) only primary and first subordinate paragraphs shall be listed in the table of contents. There shall be no table of contents preceding individual parts, chapters or sections. Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own table of contents. Volume 1 or the first manual of the set shall contain a complete table of contents covering the entire set. Entries shall indicate the volume in which the referenced material appears; e.g. "Operating Instructions, Vol 1". (F) (M) (N) Layout shall conform to Figure 16 except that a single column format shall be used when the manual is prepared in single column. (A) Layout shall conform to Figure 17.

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4.5.6.1 Table of contents for review draft copy. The page number column for tables of contents may be left blank when working on RDC during the early stages of preparation. The page number column may be filled, if the composition equipment can produce the table of contents automatically.

4.5.7 List of illustrations. Publications containing ten or more illustrations (including charts and graphs assigned figure numbers) shall have a list of illustrations showing the figure number, title, and page number of each figure. This list shall include foldout pages, schematics, etc. The security classification, if any, of illustration titles shall be indicated. Layout shall conform to Figure 18 except that a single column format shall be used when the manual is prepared in single column. Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own list of illustrations. In addition, Volume 1 or the first manual of the set shall contain a list of illustrations for all volumes or manuals in the set.

4.5.8 List of tables. Manuals containing ten or more tables (including charts assigned table numbers) shall have a list of tables showing the table number, title, and page number of each table. The security classification, if any, of table titles shall be indicated. Layout shall conform to Figure 18 except that a single column format shall be used when the manual is prepared in single column. Each manual or volume in a set (see 3.2.25 and 3.2.35) of manuals shall contain its own list of tables. In addition, Volume 1 or the first manual of the set shall contain a list of tables for all volumes or manuals in the set. When both are brief, the list of illustrations and list of tables may be included on the same page.

4.5.9 Foreword/preface/introduction. A foreword, preface or introduction shall contain the purpose and scope of the manual plus any other information required by the detail specification. The foreword/preface/introduction shall define abbreviations and nonstandard symbols, including any icons (see 3.2.17), used in the manual. The first volume of a manual shall contain general information and reporting requirements (e.g. general circuit board data, feedback reports, special TM use requirements, error reporting, unique requisition needs, etc.) regarding all volumes and specific information applicable to Volume 1, as required. When specified (see 6.2), submittal and routing instructions for TM improvement reports shall be included in the foreword/preface/introduction as provided by the acquiring activity.

4.5.9.1 International standardization agreements. The foreword/preface/introduction of a manual implementing an international standardization agreement(s) shall contain the following note:

NOTE

Certain provisions of this technical manual (identify by chapter, section, paragraph or similar manner, if appropriate) are the subject of international standardization agreement (insert the ABCA or ASCC standard number, the NATO, STANAG, NETR or NEPR number, or appropriate documentary reference). When change, revision or cancellation of this technical manual is proposed which will modify the international agreement concerned, the technical manual management activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

4.5.9.2 List of related publications. When specified (see 6.2), a list of related publications shall be included in the foreword/preface/introduction. The list shall include only those publications

referenced in the TM. The listing shall be in the following format with the title centered above the list and four spaces between the last character in the publication number column and the first character of the publication title column:

List of Related Publications

Number	Title
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4.5.9.3 List of Time Compliance Technical Orders (TCTO). When specified (see 6.2), a list of applicable TCTOs shall be included in the foreword/preface/introduction. The list shall include all TCTOs pertinent to the equipment covered. Once the modification has been incorporated and the TCTO rescinded, the listed item shall be removed at the next change. The TCTO Date shall be entered in shortened form (e.g. "12 Jan 94"). The listing shall be in the following format:

List of Time Compliance Technical Orders

TCTO Number	TCTO Title	TCTO Date
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4.5.9.4 Record of applicable technical directives. When specified (see 6.2), a record of applicable technical directives shall be included in the foreword/preface/introduction. The record shall include all technical directives that direct accomplishment and recording of material change, repositioning, modification or alteration in the characteristics of the equipment to which the technical directive applies. Once the technical directive has been rescinded, the listed item shall be removed at the next change or revision. If no technical directives (or Engineering Change Proposals (ECP) as noted below) are applicable, the word "None" shall be listed below the title. The listing shall be in the following format:

Record of Applicable Technical Directives

Type/No.	Date	Title and E CP No.	Date Inc.	Remarks
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- a. The "Type/No." column shall list the type and number of the directive. For example: "AFC 12."
- b. The "Date" column shall list the date of issue of the directive. If the number of the directive has been assigned but the directive has not been issued, the directive number shall be listed in the "Type/No." column and a dash shall be placed in the "Date" column.
- c. The "Title and ECP No." column shall list the title of the directive and the ECP number, if applicable. If a directive is the direct result of an approved ECP, the ECP number shall be shown in parentheses following the directive title.
- d. The "Date Inc." column shall list the date the information affected by the directive or ECP was incorporated. If the directive number has been assigned and the directive has not been issued (retrofit program), but the ECP that incorporates the change in the production program has been approved, the ECP coverage shall be indicated by the date listed in this column and a notation in the "Remarks" column. For example: "ECP coverage only." When the directive is approved and incorporated in a later change or revision, the date of issue shall be entered, the date of incorporation shall be listed in this column (in lieu of the ECP coverage incorporation date), and the notation shall be removed from the "Remarks" column.

- e. The "Remarks" column shall contain applicable remarks. If no remarks apply, a dash shall be entered.

4.5.10 Safety summary. All TMs containing warnings or cautions (see 3.2.40 and 3.2.4) shall have a safety summary. It shall include general precautions applicable to the safety and health exposures found in the TM. A sample of a safety summary is provided in Figure 19. The safety summary shall be located as the last page(s) of the front matter. Appendix A provides further guidance.

4.5.10.1 General safety precautions. The safety summary shall contain general safety precautions. These general safety precautions shall not be repeated in the text of the manual. The use of safety glasses while soldering or that a soldering iron is hot, in an electronics manual, is an example of general safety precautions not to be repeated in the text. Soldering may not be an everyday occurrence in a manual covering propellers; therefore, warnings or cautions related to soldering techniques shall be included in the text. When in doubt, place the warning or caution in the text (see 4.3.10 and Appendix A).

4.6 Illustrations. Style and techniques shall be of a quality which will produce artwork that will clearly, adequately, and economically portray the information to be illustrated. Illustrative material shall be used to: describe an item or idea if this can be done more efficiently and effectively by graphic methods; clarify text; present phases difficult to describe by text alone; call attention to details; and furnish graphic identification of parts and tools. Multiple sheet, or sequence number illustrations, in addition to step-by-step operational type, may be used for depicting disassembly, assembly, removal, installation, etc. Illustrations, other than foldouts, shall be located as near as possible to the point at which they are first referenced, except where this would require unnecessary duplication of illustrations.

4.6.1 Scale. Illustrations shall be prepared to as small a scale as possible consistent with effective use of space, with all essential detail legible; be same size as areas they will occupy in the manual page, or be of such oversize as to permit uniform reduction to this size (see 4.2.1.2.1). See 4.2.4.1 regarding foldout pages.

4.6.1.1 Letter size. The scale shall be such as to provide for a minimum final letter size, when printed, as required by Table I.

4.6.2 Photographs/line drawings. Line drawings shall be used in lieu of photographs (halftones), when practicable. The use of a photograph instead of a line drawing shall be determined by the practical considerations of the purpose and suitability of the illustration in the publication. Existing illustrations and engineering drawings shall be used where they meet the requirements of this document. In the early development of equipment, a line drawing may be prepared from the source data if the equipment is not available for photographing. Rendered drawings, either airbrush or wet-wash, are acceptable only if such preparation is the most efficient method available. Line tracings of photographs are also acceptable. The resulting line drawings shall be of high reproduction quality. A suitable material capable of maintaining consistent and permanent high density reproducible values shall be used for preparing the line drawings. (F) Line drawings shall be used in lieu of photographs or rendered drawings. The display of photographs in TMs shall not be allowed.

4.6.3 Photographs. When specified for use (see 6.2) photographs shall be detailed and sharp, free of heavy shadows, distorted objects, cluttered foregrounds or backgrounds, and give good contrast from white, middle tones and black.

4.6.3.1 Retouching. Photographic retouching shall be held to a minimum. Retouching shall be used only to emphasize detail, exclude unwanted detail, correct slight photographic defects and eliminate undesirable shadow for that portion of the photograph related to the text only. Quality of retouched photographs shall be such that tonal values are held when reproduced.

4.6.3.2 Prescreened photographs. When approved by the acquiring activity (see 6.2) prescreened photographs are acceptable as reproducible copy provided they will not be rescreened and are of proper quality, size, and mounted on the reproducible copy of the text page or margin data. When prescreened photographs are used, artwork will be clearly marked to indicate prescreening. Unscreened continuous tone photographs and original artwork shall be supplied, with reproducible copy, as specified by the contract.

4.6.4 Continuous tone artwork (see 3.2.8). When specified for use (see 6.2), such artwork, whether photograph or drawing, shall be clear in detail, sharp in contrast of tones and with light and shadow in proper relation to a consistent light source. The background shall be an intense white. It shall extend the full width and depth of the artwork.

4.6.5 Combination artwork. When specified for use (see 6.2), presentation of a subject by combining photographs or continuous tone artwork with line drawings, shall be limited to where this presents the subject more accurately or more clearly.

4.6.6 Diagrams/wire lists. Diagrams/wire lists shall be arranged functionally. When wiring diagrams are included in a manual, wire lists shall not be included.

4.6.7 Exploded views. Exploded views of the equipment shall be used in parts breakdowns and for reference in disassembly/assembly instructions. Index numbers (see 3.2.18) shall be used to identify parts. If the equipment is of such a nature that it cannot be adequately illustrated by a single exploded view, it shall be exploded by subassemblies as separate views. In such cases, an exploded view showing the complete equipment exploded into its major subassemblies shall be shown first. Parts which attach and connect the major assemblies together shall be shown on this illustration. These views and those in parts breakdowns shall be the same, with the sequence of index numbers in the order of disassembly.

4.6.8 Engineering drawings/wire lists. Engineering drawings/wire lists are acceptable only if they meet the content, arrangement, legibility and format requirements of the contract and detail specification, and the style, format and production requirements contained in this document. They must have all unnecessary data removed that would reduce the comprehension or clarity of the illustration and must be reduced or redrawn to meet foldout restrictions. When wiring diagrams are included in a manual, wire lists shall not be included.

4.6.9 Multisection illustrations. Each section of a multisection illustration shall be identified by a capital letter (see Figure 20). Sections may or may not be captioned, but if one section is captioned, all shall be captioned. Each caption, with the identifying letter as its first character, shall be centered with respect to the section to which it applies. Where captions are not used, the identifying letters shall be centered. Identifying letters and captions shall be larger and bolder than any other lettering on the illustration. Sections shall be separated by lines. Separation by shading shall not be used.

4.6.10 Cartoons. (N) When specified (see 6.2), the use of animated drawings and other visual techniques are permitted. Animated drawings shall not include copyrighted cartoon characters. Such presentations must serve a functional purpose.

4.6.11 Other types of illustrations. Depending on the type of information to be shown, a manual may contain illustrations such as frontispiece (assembled view), functional, cutaway, procedural, operational, exploded, location view, lubrication, waveform, etc. (see Figures 21, 22, 23 and 24).

4.6.12 Color in illustrations. Unless otherwise specified (see 6.2), color shall not be used. When color is used, it shall be held to the minimum absolutely necessary to clarify functional operations. The number of colors shall be kept to a minimum by use of tints, patterns, cross-hatching, dots, etc. When color is required, the primary colors (red, blue, yellow) shall be used first. Yellow shall not be used by itself.

4.6.12.1 Separation of colors. The black and white, or key, artwork shall be prepared on illustration board or on acetate. Each succeeding color overlay shall be made on acetate, or equivalent, and attached securely to the key artwork. Each color overlay shall be marked with its correct color. A color legend shall be an integral part of an illustration. The legend shall contain an exact duplicate of each solid, tint, or pattern of color and identify the usage in the illustration.

4.6.12.2 Register marks. The key artwork and each overlay shall contain a minimum of three register marks located outside the reproduction area, one centered on each side, and one centered at the top or bottom. The register marks on each overlay shall accurately align with one another and with the key art.

4.6.13 Border rules. Border rules shall not be used for single illustrations, but shall be used to separate multisection illustrations on the same page (see Figure 20).

4.6.14 Use of the human figure. Where it is necessary to illustrate an operation, procedure, or installation, illustrations may include a human figure or parts of the body. Jewelry shall not appear in any illustration. The human figure shall not be permitted to obscure details of the equipment necessary for a complete understanding of its operation. The human figure shall be clothed as designated by the acquiring activity. A cross section of races and sexes shall be used.

4.6.15 Credit lines. The artist's name shall not appear on any artwork; neither shall a manufacturer's name, symbol, or trademark appear on artwork for the purpose of identifying the illustration. A contractor's identification number may be used. When used, such numbers shall be in approximately 4- to 6-point type and placed in the lower right-hand corner of the illustration sufficiently removed to avoid being confused as part of the illustration or margin data.

4.6.16 Callouts (see 3.2.3). Index numbers, reference designations, nomenclature, leader lines, legends, procedures, etc, shall be used, when necessary, to identify significant features. Callouts shall be prepared by a mechanical or electronic method, rather than freehand lettering, except that engineering drawings prepared as stated in 4.6.8 are acceptable. Unless otherwise specified (see 6.2) type size shall be no smaller than 8-point and no larger than 10-point. Lettering shall be in upper case. Nomenclatures shall appear on illustrations only if it can be done without crowding or reducing type size so as to make reading difficult (diagram callouts shall be no smaller than 8-point). Callouts shall be placed in the background areas of illustrations when practical.

4.6.16.1 Index numbers (see 3.2.18). Index numbers for each separate figure shall start with Arabic numeral 1 and continue consecutively. All multisheet illustrations shall be considered one figure. Sequence on exploded views used to show assembly/disassembly shall be in disassembly order. Otherwise, sequence shall be from top to bottom or clockwise, when possible. New callouts inserted between items when an illustration is changed shall be the same as the preceding index number with an added decimal number, e.g. 22.1, 22.2, etc. When it is necessary to add a callout between items which have already been added by the preceding method, an alpha character shall be used (e.g. a callout added between 22.1 and 22.2 would be 22.1A). This system shall also be used in basic publications when errors are discovered so late in preparation that renumbering of all following index numbers would delay submittal. Suffixed index numbers need not be eliminated for a revision unless the illustration must be reaccomplished. All functional items shown on exploded views shall be identified except for exploded views used for disassembly/assembly.

4.6.16.2 Nomenclature (see 3.2.26). Nomenclature of more than one line shall have the left margin justified. All lines of copy shall parallel the horizontal edges of the figure, whenever possible. When specified (see 6.2) a cross reference shall list the official nomenclature and its corresponding acronym or general usage nomenclature.

4.6.16.3 Leader lines and arrowheads (see 3.2.21). Leader lines and arrowheads may end close to the callout and object, or may touch the objects to which they apply. Lines shall be uniform, short and straight as possible; however, dog leg shaped lines are permitted. Lines and arrowheads shall not cross or come in contact with other callout lines or arrowheads nor shall they obscure essential details. For clarity, where illustration line(s) and leader line(s) intersect, break illustration line(s) to provide white space on either side of leader line. Arrowheads may be added for clarity. Arrowheads shall be uniform in shape and size when multiple arrowheads are used on a page.

4.6.17 Legends (see 3.2.23). When index numbers are used, a legend consisting of their numerical listing and their identification shall be included on, adjacent to (same page), or facing, the artwork.

4.6.18 Steps. Essential illustrations depicting mechanical operations shall be included as necessary. Operational or procedural illustrations shall have one or more text steps with each illustrated step. It is not necessary to illustrate each step of a maintenance procedure, such as the removal of screws with an ordinary screw driver, lifting off a cover after the screws have been removed, etc. Procedural illustrations should supplement the text by clarifying procedures which are of a special nature or are not obvious. The text step shall be as close to the illustrated step as possible. Steps shall be identified in the order in which they are to be accomplished (see Figure 23). Alternate types of operational and procedural step illustrations are acceptable (see Figure 24).

4.6.19 Reference designations. The application of reference designations shall be consistent with the reference designations marked on equipment.

4.6.20 Crop and size marks. Each separately supplied illustration shall have the reproduction area defined by crop marks appearing on each of the four corners marking the horizontal and vertical dimensions of the area to be reproduced. The lines shall extend no closer than 1/4-inch to the outside of the reproduction area. The exact reproduction size shall be indicated between crop marks. Marks shall not be drawn with ball point pen or grease crayon. Crop marks shall be approximately 3/8-inch long and shall not cross or touch (see Figure 25).

4.6.21 Mounting of artwork. Drawings/diagrams/illustrations, needing to be incorporated in a text page manually, shall be securely fastened to a mounting board by a process that will protect the artwork, will not discolor or distort the illustration, and will assure its being free of wrinkles and blisters. The size of the mounting board shall allow for a minimum border of 1 1/2-inches on all four sides of the image area of each illustration to accommodate required external identification markings. Security classification, if applicable, shall be placed at the top and bottom center of the reverse side of the mounting board and similarly placed outside the image area on the front (see Figure 26).

4.6.22 Identifying artwork. Artwork not affixed to the completed final reproducible copy shall bear the TM identification number and figure number outside of the reproduction area. The security classification, if applicable, shall be placed at the top and bottom center, also outside the reproduction area. To eliminate the possibility of printing illustrations in incorrect positions, the top of the artwork shall be identified (see Figure 26).

4.6.23 Covering of artwork. All board mounted artwork shall be protected by an inner flap of non-oil tissue or vellum, and an outer flap of heavy paper. The tissue overlay and protective flap shall be cemented or securely taped to the back of the mounting board at the top of the illustration and folded over the face of the illustration. The figure number, page number and TM identification number shall appear in the outside upper right corner of the outer flap (see Figure 26). The security classification, if applicable, shall also be placed at the top and bottom center of the outer flap. Computer generated artwork does not require an inner flap of non-oil tissue or vellum.

4.6.24 Review of illustrations. Illustrations shall not be furnished separately for review. If a publication is reviewed, illustrations forming a part of the publication shall be included in the review. Each illustration copy shall be approximately the same size as a page of text, except for those of foldout size which shall not exceed maximum foldout dimensions.

4.6.25 Line drawing details.

4.6.25.1 Darkness and sharpness of lines. The darkness and sharpness of lines shall be sufficient to reproduce clearly at required reproduction size without additional treatment (see Figures 27 and 28). Parallel lines on wiring and schematic diagrams shall in no case be less than 1/16-inch apart when reduced to printed size (see Figure 29). Secondary lines, such as those used to indicate extensions or measurements, shall be lighter but strong enough to reproduce clearly at reproduction size. Shading may be used to give substance and form to the item depicted, to sharpen the contrast between the subject and its background or to increase effectiveness. Shadows shall be used only when necessary to provide a clear understanding of form, shape or depth. Shading effects shall not be used for decorative purposes. Accented lines may be used to emphasize detail. Lines, cross-hatching, or mechanical patterns used for coding shall remain clearly defined when reduced to reproduction size (see Figure 30).

4.6.25.2 Designations, diagrams, and symbols. Designations, diagrams, graphic symbols and letter symbols shall be consistent with industry standards. New designations, diagrams and symbols may be used if they are explained in the manual's foreword/preface/ introduction. Acquiring activity approval is required before any new designations, diagrams or symbols are used.

4.7 Changes (see 3.2.5). When specified (see 6.2), the change package shall conform to the format of the basic manual, and shall incorporate all approved information (e.g. engineering change proposals,

ship alterations, ordnance alterations, machine alterations, field changes, etc.). The changes shall also incorporate all advanced change notices and resolution of outstanding deficiencies.

4.7.1 Advanced change pages. When specified (see 6.2), advanced change pages for changes to loose leaf manuals shall be provided. Printed pages from the manual may be used for the changed and unchanged pages, if legible and applicable. Only changed paragraphs need to be typed and mounted in the proper place (size permitting) on the existing printed page. Copy shall be furnished for both sides of the page on which a change is made, even though change is made to one side only. Pages removed from the printed manual to be used without change shall be pasted to bond paper of the same size as the manual. Unchanged portions of pages may also be mounted and used in conjunction with the typed, double spaced new material.

4.7.2 Changes to cover and title page. Except for silk screened or otherwise expensive covers, the cover and title page of unclassified manuals shall be updated to reflect the current Distribution Statement (see 4.5.1.11).

4.7.3 Changes to PTMs and FRC. Preparation shall conform to the style and format used in the basic manual.

4.7.3.1 Numbering of changes. Each change to a manual shall be numbered or lettered, as specified by the acquiring activity (see 6.2), in sequence and dated. Identification of changes after each revision of a manual shall begin over again with number 1 or letter A as applicable. Unless otherwise specified (see 6.2), the change date shall be the date at which the material to be included was received (copy freeze date [see 3.2.9]).

4.7.3.2 Numbering of added material. When paragraphs/illustrations/tables/pages are added by a change, existing paragraphs/illustrations/tables/pages shall be renumbered. If this involves renumbering more than 10 paragraphs or will affect more than five pages, the following method shall be used. Except when added at the end of a sequence, in which case the next consecutive number shall be used, paragraphs shall be numbered by adding an alpha character (e.g. 2.4A, 2.4B, 2.4.1A, etc.), to the preceding paragraph number (see Figure 7). Added illustrations/ tables/pages shall be numbered by adding a decimal (e.g. Figure 3-2.1, page 3-26.1, etc.). When it is necessary to add an illustration/table/page between items which have already been added by the preceding method, an alpha character shall be used (e.g. a page added between 3-26.2 and 3-26.3 would be 3-26.2A). Pages shall not be added between a right-hand (odd numbered) and a left-hand (even numbered) page. When new material is to be added to a right-hand page, any overrun shall be carried to the left-hand page. The overrun from the left-hand page shall be placed on the added page. Where material is to be added to a right-hand page (e.g. 2-5) and adequate blank space is available on the preceding left-hand page (e.g. 2-4), material at the top of 2-5 shall be moved to the bottom of 2-4 and the new material added to 2-5.

4.7.3.3 Difference data sheets. When specified (see 6.2), Difference Data Sheets shall be used to provide information on additional models of equipment which constitute minor changes from the basic design. Separate Difference Data Sheets shall be prepared for each additional model covered. The first page of the Difference Data Sheets shall conform generally to Figure 31.

4.7.3.3.1 Format (see Figure 32).

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- a. Sheets shall be identified with the title "DIFFERENCE DATA SHEET" centered at the top of each page.
- b. The first page of each sheet (for a specific model) shall have a heading in uppercase type consisting of the nomenclature and the model, type/type designation, or part number of the item covered. The heading shall be accentuated by having lines drawn above and below it and extending across the width of the page. The heading shall be followed by a statement to this effect:

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS
TECHNICAL MANUAL ARE APPLICABLE TO THIS MODEL EXCEPT FOR THE
DIFFERENCES CITED IN THIS DIFFERENCE DATA SHEET.

- c. Sheets for each model shall start on a right-hand page. Page numbers, figure numbers and table numbers shall run consecutively throughout the sheets. Sheets shall be added as required. Paragraphs need not be numbered, but if numbering is used, single Arabic numerals, beginning with "1" for each added model may be used.

4.7.3.3.2 Arrangement. Sheets shall briefly specify how operation and maintenance procedures for that configuration differ from the procedures for the representative configuration contained in the preceding sections or chapters. Sheets shall contain the following data, as appropriate, on one or two pages and shall not exceed four pages.

- a. An external view of the model if the view is significantly different from the one previously shown.
- b. A table of tabulated data if the data are significantly different from those previously presented.
- c. Illustrations which are essential for clarifying differences. Illustrations in preceding sections or chapters shall not be duplicated, but may be referenced if necessary. Reference shall not be made to illustrations on other Difference Data Sheets.
- d. Brief coverage of subjects specified for the original model. The title of each of the preceding chapters shall be listed in the same order of arrangement as the manual. Short, concise statements shall be used to convey the similarity or explain the difference in procedures.

4.7.3.4 Transmittal cover sheets. When specified (see 6.2), classified or unclassified changed pages, supplements or TCTOs to a classified manual shall be covered with an appropriate transmittal cover sheet (see Figure 33). Each transmittal cover sheet shall be prepared and submitted in the same form as the changed pages, i.e. reproducible copy, negatives, magnetic tape, disk, etc.

4.7.3.5 Changes to illustrations. When changes are made to illustrations, the original artwork shall be used unless the preparation of new artwork is less expensive.

4.7.3.5.1 Illustration changes. Sheets added to a set of multisheet illustrations which fall between existing sheets shall be assigned the preceding number plus a decimal number. For example: if a sheet is added between sheets 2 and 3, the added sheet becomes 2.1. If possible, the new sheet shall be added after the last sheet and be assigned the next consecutive number. If a callout (see 6.3.3) is

deleted from an illustration, the word “(Deleted)” in parentheses shall be placed after the appropriate number in the legend.

4.7.3.5.2 Index number changes. Where a change to an illustration adds index numbers between existing numbers, the added numbers shall be the same as the preceding index number with an added decimal number, e.g. 22.1, 22.2, etc.

4.7.3.6 Deleted paragraphs, steps, illustrations, tables. Where a change deletes a paragraph, step/substep, illustration, or table without substituting another, the space formerly occupied by the paragraph, step/substep, illustration, or table can be used for other instructions, allowing for sufficient space to provide 1/4-inch above and below a sentence such as “Paragraph 4-2 deleted.” The table of contents, list of illustrations, list of tables and index shall be changed as necessary.

4.7.3.7 Deleted pages. When page number continuity is broken by deletion of a page and a blank page results, a statement indicating the deletion shall be placed in the bottom margin (right or left corner, or centered, as space permits) of the preceding page or top margin of the succeeding page. For example: “All data on page including Figure deleted.” This also applies when two back to back pages are deleted. The statement shall be used only if the same manual change affects a preceding or succeeding page. A preceding or succeeding page shall not be changed merely to add this statement. In such instances, the list of effective page listings will be adequate.

4.7.3.8 Change designator (see 3.2.6). Each page containing changed or added material shall bear the words “Change...” placed at the bottom of the page in the same corner and on the same line as the page number. The change designator shall begin approximately 1/2-inch to the right of the page number for an even numbered page, and end approximately 1/2-inch to the left of the page number for an odd numbered page (see Figure 34). This change designator requirement is also applicable to all added pages, including those placed at the end of a manual.

4.7.3.9 Change symbols for text and tables. Changes (except as noted below) to the text and tables (including new material on added pages) shall be indicated by a vertical line in the margin. The line shall extend the entire area of the material affected (outer margin for double column material, margin opposite binding edge for single column material) (see Figure 34 and 35). Exception: pages with emergency markings (black diagonal lines around three edges) shall have the vertical line symbols placed along the inner margins for single column; for double column, the vertical line symbols which apply to the outside column shall be placed in the gutter between columns. Previous change symbols on a page shall be deleted when a page is subsequently changed. Symbols shall show current changes only. The vertical line change symbol shall be 6-point in width. It may be reduced 10 percent in width to allow for automatic composing equipment use providing it remains legible and obvious. If the composing equipment used is incapable of producing a vertical line, change symbols such as a number sign “#”, plus sign “+”, black circle or black square, or the letter “C”, “R”, or “X” may be used in lieu of the vertical line, if approved by the acquiring activity (see 6.2). The meaning of these symbols shall be explained in the foreword/preface/introduction of the manual. Change symbols are not required for:

- a. Introductory material.
- b. Indexes where the change cannot be identified.

- c. Blank space resulting from the deletion of text, an illustration or part of an illustration, or a table (see 4.7.3.6).
- d. Correction of minor inaccuracies such as spelling, punctuation, relocation of material, renumbering paragraphs, etc, unless such correction changes the meaning of instructive information and procedures.
- e. Replacement or addition of a complete part, chapter, or section.

4.7.3.9.1 Change symbols for illustrations. Changes to line drawings, charts prepared as illustrations, graphs, diagrams and schematics shall be indicated by shading and screening to highlight the area containing the changed information. Extensively changed presentations shall be indicated by a screen border around the affected area. For minor changes not suitable for shading or screening, a miniature pointing hand shall be used.

4.7.3.10 Changes to looseleaf publications.

4.7.3.10.1 New material identification. The new material shall be identified as described in 4.7.3.9. An explanation of the method used shall be included in the change instruction sheets.

4.7.3.10.2 Change instruction sheet. When specified (see 6.2) a change to a loose leaf manual shall include a change instruction sheet in the format of Figure 36. The change instruction sheet shall:

- a. Include the following statements:

(TM identification number and date) is changed as follows:

File this change sheet in front of the publication for reference purposes.

- b. Be the first page of each change with additional pages, as required.
- c. Provide clear instructions for required changes listed page by page.
- d. Specify deleted or added pages, reasons for the changes, instructions for completing the change record, and instructions that the sheet be inserted in the volume.
- e. If applicable, indicate that the change is the result of an equipment alteration, e.g. ORDALT, and identify the alteration by number.
- f. Include an instruction for holders of the manuals at accomplishing activities not to incorporate the change in their copies of the manual until it is verified that the alteration has been accomplished. Also, an instruction for all other holders of the manual to incorporate the changes in their copies of the manual, shall be included.
- g. The appropriate distribution statement and export control notice (see 4.5.1.11 and 4.5.1.12), if applicable, shall be placed on the front of the change instructions sheet. These statements shall be taken from the title page of the publication being changed.

4.7.3.11 Changes to permanently bound publications.

4.7.3.11.1 Deletions. When a paragraph is to be deleted, the number of the page on which it appears shall be stated, followed by a statement that the paragraph is rescinded. For example: "Page 3. Paragraph 2-1 is rescinded."

4.7.3.11.2 Additions. Except when added to the end of a sequence, added paragraphs shall be numbered according to 4.7.3.2. When added to the end of a series, the sequence shall be continued by using the next number or letter. The number of the page where the added material would appear if it were incorporated into the existing manual shall be stated, followed by a statement to the effect that the material is being added. This shall be followed by the number, title, and text of the new paragraph. For example:

Page 3-14. Paragraph 3.5.1A and 3.5.1B are added after 3.5.1.

3.5.1A Refer to TO XX-XX-XXX for coaxial connector repair procedures.

3.5.1B Refer to TO XX-XX-XX for LRU checkout and trouble-shooting procedures.

4.7.3.11.3 Text supersession. When a paragraph is changed extensively or replaced entirely, the paragraphs shall be superseded. The number of the page on which the paragraph appears shall be stated, followed by a statement to the effect that the paragraph is superseded. This shall be followed by the number, title, and text of the superseding paragraph. For example:

Page 1-6. Paragraph 1.2 is superseded as follows:

1.2 RECORD AND REPORT FORMS.

1.2.1 Depreservation Guide. STD Form XXXX, Depreservation Guide for Engineer Equipment.

1.2.2 Other Forms. For other record and report forms applicable to operator/crew and organizational maintenance, refer to TM XX-XXX.

4.7.3.11.4 Minor changes. When a minor change to a lengthy paragraph is necessary, only the affected portion of the paragraph shall be stated. For example:

Page 1-10, paragraph 1.12 b(3) - In line 1, "four copies" is changed to read "three copies".

4.7.3.11.5 Changes to tabular material. When changes are made in lengthy tabular material, deletions, additions, and substitutions shall be listed in page sequence and the page number on which each change occurs shall be shown. For example:

Page B-15, Appendix B.

The following are deleted from the list of classes:

Page B-15. 5133 Drills, Counterbores and Countersinks, 5905 Resistors

Page B-16. 6115 Generators and Generators Sets

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The following changes are made in the columns indicated:

Page B-21. The description of class 4010 is changed to read "Chain and Wire Rope".

Page B-27. Class number "2960", appearing between class 2930 and 2940, is corrected to read "2935".

4.8 Revisions (see 3.2.33). When specified (see 6.2), a complete update, nonsuperseding or pickup revision shall be prepared. Revisions shall incorporate current information from previously issued changes to the existing manual. The acquiring activity will determine the type of revision. The following information shall be presented to the acquiring activity for consideration in approving the type of revision to be prepared. This information shall be presented sufficiently in advance to permit the acquiring activity time to reach a decision, yet not delay submittal of data.

- a. Percent of change.
- b. Reason for revision; such as, change in equipment configuration, excess number of changes outstanding, major inadequacies, cost considerations, etc.

4.8.1 Renumbering and removal. In a complete revision, all pages, paragraphs, illustrations and tables shall be renumbered, as necessary, to eliminate all number suffixes and to establish correct sequence. Complete revisions shall be prepared to current specifications and standards. In an update revision, suffixed paragraph, illustration and table numbers shall be retained when use of the manual will not be substantially improved by renumbering. All change numbers and change dates shall be removed from pages. All partial pages, miniature pointing hands, shading, screening, vertical lines in margin and other change symbols shall be eliminated. For index numbers on illustrations, see 4.6.16.1.

4.8.2 Revision change symbols. When specified (see 6.2), after all previous change symbols have been eliminated, new change symbols shall be inserted to identify technical changes in text, illustrations and tables that differ in the revision from those contained in the latest previous edition of the manual (see 4.7.3.9).

4.9 Supplements (see 3.2.37). When specified (see 6.2), supplements shall be prepared. They shall conform in style and format with the existing manual. Appendix C provides the DTD for electronic delivery of supplemental manuals. Appendix D provides the DTD for electronic delivery of safety, operational and technical order page supplements.

4.9.1 Classified supplements. The title pages of both the basic manual and the supplement shall contain a cross-reference note (see 4.5.1.8). Supplements shall contain the minimum amount of information required to protect security and maintain continuity of thought. Acquiring activity approval is required for each supplement.

4.9.2 Safety supplements (see Figure 37). All text, lettering, numbering, etc, for safety supplements shall be in red. Detailed requirements for formal safety supplements are as follows:

4.9.2.1 Safety supplement margin. The abbreviated title of a safety supplement shall have multiple "SS" along the top, bottom, and side borders with the word "SAFETY SUPPLEMENT" at the bottom of the page.

4.9.2.2 Title designation. The words “SAFETY SUPPLEMENT” shall be positioned above the words “TECHNICAL MANUAL”. The nomenclature shall be the same as the basic manual.

4.9.2.3 Supplement notices and replacement notices. A notice shall reference the basic manual supplemented, and, if applicable, reference any publication(s) replaced. For example:

This publication supplements TO 1C-141A-6, dated 13 September 1979 and supersedes interim safety supplement TO 1C-141A-6SS-144, dated 23 December 1980, with no changes to the text.

4.9.2.3.1 Reference notice. The following, or similar, sentence shall be provided in the notice:

A suitable reference to this supplement will be made on the title page of the basic publication.

4.9.2.4 Responsibility notice. The responsibility notice shall be positioned as shown in Figure 37.

4.9.2.5 Distribution statement. Unless otherwise specified (see 6.2), the distribution statement from the basic manual shall be used.

4.9.2.6 Publication date. The publication date shall be the same as the date of the replaced interim safety supplement unless the formal supplement contains additional changes.

4.9.2.7 Security information. The security markings shall be the same as for other title pages.

4.9.3 Operational supplements (see Figure 38). Detailed requirements for formal operational supplements shall be the same as for formal safety supplements except:

- a. The margin shall consist of multiple “OS” in lieu of “SS”.
- b. The words “OPERATIONAL SUPPLEMENT” in lieu of “SAFETY SUPPLEMENT”.
- c. The supplement shall be printed in black.

4.9.4 Routine supplements. A routine supplement title page will be the same as operational supplement title page except that the title shall be the single word ‘SUPPLEMENT’ and margins shall be blank.

4.9.5 Incorporation of supplements into manuals. Whenever practical, supplements, other than those of a higher classification, shall be incorporated into the manual's next change.

4.9.6 Technical Order Page Supplements (TOPS). When specified (see 6.2), TOPS shall be issued to supplement individual pages of a TM. Figure 39 provides an example of a TOPS.

4.9.6.1 General. TOPS shall be printed on green paper. TOPS may be an accumulation of data from several TOPS or be independent. An accumulation type TOPS shall contain only new or changed TOPS data pages. Unchanged TOPS data pages shall not be reissued.

4.9.6.2 Numbering and indexing. TOPS shall have the same title as the basic TM. TOPS pages shall be numbered with the basic TM identification number followed by the suffix "TP" and a dash number assigned in sequence. For example: "TO 00-5-1TP-1."

4.9.6.3 TOPS title page. TOPS shall use an abbreviated title. The TM identification number shall be printed flush right above the upper line of the abbreviated title. On inspection work cards which require six hole drill, the TM identification number shall be printed in the center of the page above the upper line of the abbreviated title. The words "TECHNICAL ORDER PAGE SUPPLEMENT" shall be centered beneath the upper line of the abbreviated title. The TM identification number and date of the TM being supplemented by the TOPS shall be as shown in Figure 40. Security classification markings for classified TOPS shall be in accordance with DOD 5220.22-M and 5200.1-R. In addition to normal supplement and supersedure notices, the abbreviated title shall contain a note stating whether or not the TOPS is modification related. If there is a modification TCTO, it shall be referenced. Other explanatory notes shall be added, such as TOPS issued out of sequence. The sequence of notes shall be supplement, supersedure, then explanatory.

4.9.6.4 TOPS list of effective pages. The List of Effective Pages shall be on the lower half of the TOPS title page and shall include a list of TOPS affected and their issue date. The list of effective pages shall also include a listing of all TOPS data pages included/deleted/superseded and the TOPS number in which they were issued. When the list of effective pages is too long to be included in its entirety on the lower half of the title page, the list shall be continued on the reverse side of the title page with the heading "List of Effective Pages - Continued". The page number for TOPS continued list of effective pages shall be TOPS A. When more than one continued list of effective pages is required, the additional pages shall be assigned a decimal number (TOPS A.1, A.2, etc.)

4.9.6.5 TOPS data pages. Each TOPS data page shall include the TOPS number centered at the top of the page and the page number centered at the bottom of the page. They shall be printed on one side only and shall be drilled to permit filing in the TM facing the affected page. TOPS data pages shall be numbered the same as the affected TM page. When, within a single TOPS, more than one page affects the same TM page, the first TOPS page shall be numbered the same as the TM page and the additional TOPS pages shall be assigned the page number plus a decimal number. For example: TM page 4-2, TOPS pages 4-2, 4-2.1, 4-2.2, etc. The TOPS data page shall contain only the information being changed, added or deleted. When possible, the data shall be in the same position on the TOPS page as the affected data on the TM page. Each TOPS page which is the result of a modification shall have the statement "RESULT OF TCTO" at the bottom, centered, all capitals, two spaces above the page number. If more than one modification or both modification and nonmodification data are on a page, each applicable data entry shall start with "AFTER (BEFORE) TCTO" TOPS pages superseding existing TOPS pages shall have the statement "SUPERSEDES PAGE OF TP-..." at the bottom, centered, all capitals, two spaces above the page number. However, if a complete TOPS is superseded, the TOPS supersedure notice will be adequate.

4.9.6.6 Superseding TOPS. When TOPS are superseded by a revision, change, another TOPS, or a safety or operational supplement, the supersedure notice shall list the superseded TOPS.

4.10 Brief manuals. Unless otherwise specified, manuals of eight pages or less shall be prepared in accordance with the requirements stated elsewhere in this standard. If specified, brief manuals shall conform to the requirements below. Appendix E provides the DTD for electronic delivery of brief manuals conforming to the requirements below.

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- a. Not be required to have front matter (except abbreviated title).
- b. Have the first page consist of an abbreviated title and text below it.
- c. Have chapters or sections begin on left- or right-hand pages with no blank pages.
- d. Contain more than one chapter or section on a page, where possible.
- e. Have pages, paragraphs, illustrations and tables numbered consecutively throughout the manual with single Arabic numerals, disregarding chapter and section number.
- f. Always be revised, never have changes issued.
- g. Contain the words "THE END" following text on the last page.

4.11 Combined manual. If specified by the procuring activity (see 6.2), an illustrated parts breakdown (IPB) shall be combined with the maintenance manual. When combined, the IPB chapter shall be prepared in accordance with MIL-PRF-38807 and shall be the last chapter or section of the manual. The IPB chapter shall be sectionalized (Section I Foreword, Section II Maintenance Parts List or Repair Parts and Special Tools List, etc.).

5. DETAIL REQUIREMENTS.

This section is not applicable to this standard.

6. NOTES.

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Technical publications prepared in accordance with this standard are intended for use in the installation, operation, maintenance, repair and logistics support of equipment/systems or for accomplishment of assigned missions and to set a style and format standard for related publications for which no other standards exist.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Issue of the DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2, 2.3, A.2.1, B.2.1.1, C.2.1.1, D.2.1.1, E.2.1.1).
- b. If outlines shall be provided (4.1.4). (F) Manual outlines are required when using MIL-M-83495 and MIL-M-87929.
- c. If PTM copies of the manual are to be provided as interim editions, preliminary issues or for other early uses (4.1.5).
- d. Types of manuals to be provided (RDC, PTM, FRC) (4.1.7).
- e. If minimum acceptable features for FRC shall be other than as specified in this document (4.2.1 c).

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- f. Whether 8 1/2 by 11 inch manuals will be single or double column (4.2.1c (1)).
- g. Page size, if other than 8 1/2 by 11 (4.2.1.2). (F) Page size shall be as specified in the applicable content Specification.
- h. If FRC shall be other than final size (4.2.1.2.1). (F) FRC shall be final size.
- i. (N) If the binding edge shall indicate the equipment or subject to which the manual applies (4.2.1.4.1.3).
- j. (A) (N) If the outer edge shall indicate significant reference information (4.2.1.4.1.4).
- k. (N) If the issue indicator shall be used (4.2.1.4.2.3). (F) Issue indicators shall be used.
- l. (N) If "Original" shall be used in the issue indicator (4.2.1.4.2.3). (F) The word "original" shall not be used.
- m. If volume number shall be included with the page number (4.2.2.2.2).
- n. (A) If index page numbers shall be other than as specified in this document (4.2.2.2.6).
- o. If foldout pages may be prepared (4.2.4.1). (F) Will accept foldout pages unless otherwise specified in content specification.
- p. If preparation of foldout pages shall be other than as specified in this document (4.2.4.1). (F) Will accept fold-out pages interspersed with the text when required to enhance TO usability. The entry for 8 1/2 by 11-inches manuals shall be as follows: (4.2.4.1.e)

<u>Manual Size</u>	<u>Foldout maximum page size (including blank apron)</u>	<u>Foldout Maximum printable area</u>
8 1/2 by 11-inches	25 1/2 by 11-inches	†16 1/2 by 10-inches

- q. If volumes shall be other than as specified in this document (4.2.9.1). (F) Volumes will be used when specified in content specification
- r. If index requirements are other than as specified in this document (4.2.9.8).
- s. (A) (N) If Reading Grade Level of narrative material shall be other than as specified in this document (4.3.3).
- t. (A) (N) If the placement of warnings and cautions shall be other than as specified in this document (4.3.10).
- u. (A) (N) If the use of health hazard icons shall be other than as specified in this document (4.3.10.1).
- v. (F) If the use and style of NSP symbol shall be other than as specified in this document (4.3.10.2.1).

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- w. (A) (N) If the use and style of ESDS Symbol shall be other than as specified in this document (4.3.10.4.1).
- x. If the use and style of the FCP symbol shall be other than as specified herein (4.3.10.5.1).
- y. If energy efficiency information is required (4.3.11). (F) Not required.
- z. (A) (N) Front matter peculiar requirements (4.5).
- aa. If there shall be a cover and title page (4.5.1). (F) Manuals shall have a title (not cover) page.
- ab. If abbreviated titles shall be used (4.5.1) (F) Abbreviated title pages shall only be used on manuals of eight pages or less and on TO Page Supplements (TOPS), TO Field Change Notices (TOFCNs), Operational Supplements and Safety Supplements.
- ac. (A) If the date shall be included on the cover (4.5.1).
- ad. If a backbone is required (4.5.1). (F) A backbone shall not be used.
- ae. (A) (N) If T-2 page shall be used (4.5.1).
- af. (A) If Draft or Final Draft shall be used (4.5.1.2).
- ag. If title warning is required (4.5.1.3.1). (F) A title warning is required.
- ah. (A) Use of National Stock Number, applicable to the equipment, on cover/title page (4.5.1.3.4).
- ai. (N) If identification of the manufacturer shall be other than as specified in this document (4.5.1.3.6).
- aj. (A) (N) If use of contract number shall be other than as specified in this document (4.5.1.4).
- ak. If supersedure notice shall be other than as specified in this document; and if supplements/RACs/PTMs shall be listed in the notice (4.5.1.6). (F) Supersedure notices shall be used and shall include supplements superseded. No supersedure notice is required when PTOs are superseded.
- al. If volume notice is required (4.5.1.9).
- am.
If disclosure notice is required (4.5.1.10). (F) Disclosure notices shall be used for FMS manuals only.
- an. Wording for distribution statement (4.5.1.11).
- ao. If export control notice is required (4.5.1.12).
- ap. Authority notice wording (4.5.1.15). (F) The authority notice is "Published Under Authority of the Secretary of the Air Force."
- aq. (A) If a warning page(s) is required (4.5.2).
- ar. If verification status page(s) is required (4.5.4). (F) Required.

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- as. If contractor format and/or additional columns may be used on verification status page(s) (4.5.4).
- at. If change record shall be other than as specified in this document (4.5.5). (F) Not applicable.
- au. If submittal and routing instructions for TM improvement reports is required (4.5.9).
- av. If a list of related publications is required (4.5.9.2). (F) A list of related publications is required when such documents are required for completion of procedures directed in the TO.
- aw. If a list of TCTOs is required (4.5.9.3). (F) A list of TCTOs shall be provided.
- ax. If a record of applicable technical directives is required (4.5.9.4). (F) When applicable (usually for PTOs), the List of Applicable Technical Directives shall be included in, or replace, the list of TCTOs.
- ay. If photographs may be used (4.6.3). (F) Photographs shall not be used unless absolutely essential for clarification of procedures or identification of locations of items.
- az. (A) If prescreened photographs may be used (4.6.3.2).
- ba. (A) If continuous tone artwork may be used (4.6.4).
- bb. (A) If combination artwork may be used (4.6.5).
- bc. (A) If cartoons may be used (4.6.10).
- bd. If color may be used (4.6.12). (F) Color may only be used if applicable content Specifications authorize its use.
- be. (A) (N) If callout type size shall be other than as specified in this document (4.6.16).
- bf. If a nomenclature cross reference is required (4.6.16.2).
- bg. If change packages are required (4.7).
- bh. If advanced change pages for looseleaf changes are required (4.7.1).
- bi. If changes shall be numbered (A) or lettered (M) (N) (4.7.3.1). (F) Changes shall be numbered and dated as of the copy freeze date.
- bj. If change date shall be other than as specified in this document (4.7.3.1).
- bk. If difference data sheets shall be furnished (4.7.3.3).
- bl. If a transmittal cover sheet is required (4.7.3.4). (F) Cover sheets are required.
- bm. (A) (N) If change symbols shall be other than as specified in this document (4.7.3.9).

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- bn. (A) (N) If change instruction sheets shall be furnished (4.7.3.10.2).
- bo. If revisions shall be prepared and type revision (4.8).
- bp. (A) If revision change symbols are required (4.8.2). (F) Revision change symbols are required unless the changes are so extensive as to defeat the purpose of symbol use.
- bq. If supplements shall be prepared (4.9).
- br. (A) (N) If a supplement distribution statement shall be other than as specified in this document (4.9.2.5).
- bs. If TOPS shall be prepared (4.9.6).
- bt. (A) (N) If brief manual(s) shall be other than as specified herein (4.10).
- bu. If manuals combined with IPB will be prepared (4.11).

6.3 Subject term (key word) listing.

Copy, Final Reproducible
Copy, Review Draft
Manual, Preliminary Technical
Manual, Technical

6.4 Changes from previous issue. The margins of this standard are marked with vertical lines to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Some changes have not been marked. Several "hanging" paragraphs were moved into their parent and are not marked. The illustrations are not marked because they were totally revised into a digital format. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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TABLE 1. Style, Capitalization, Leading and Vertical Spacing.

Use	Type Style	Capitalization	Leading	Vertical Spacing ²
TM identification no.	Sans serif, bold 10	Upper case		36 points from top of page to top of text
Page no.	Sans serif, bold 10			36 points from bottom of page bottom of text
Change no.	Sans serif, bold 10	Upper and lower case		36 points from bottom of page bottom of text
Page content/equipment identification	Sans serif, bold 10	Upper and lower case		36 points from top of page top of text
Security classification	Sans serif, bold 14	Upper case		36 points from top and bottom of page to top and bottom of text respectively
Deleted page notation	Serif, bold 8	Upper and lower case		36 points from top and bottom of page to top and bottom of text respectively
Chapter no. and title	Sans serif, bold 14	Upper case		48 points below TM identification no.; 18 points above text, table, or illustration
Section no. and title	Sans serif, bold 14	Upper case		28 points below TM identification no. or text of previous section; 24 points below chapter title; 18 points above text, table, or illustration
Table of contents, list of illustrations, list of tables, fore-word/preface/introduction, safety summary, index, glossary and appendix headings	Sans serif, bold 14	Upper case		48 points below TM identification no.; 18 points above text
Text	Serif 10	Upper and lower case		18 points below TM identification no. or chapter/section title; 12 points above or below table or illustration; 6 points above page no.; 12 points above or below warning, caution, and note headings

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TABLE I. Style, Capitalization, Leading and Vertical Spacing - Continued.

Use	Type Style	Capitalization	Leading	Vertical Spacing
Emphasis	Italic Bold 10	Upper and Lower Case	1	
Formulas and Equations	Math 10	Upper and Lower Case	1	12 Points Above/Below Text, Table or Illustration
Primary Sideheads	Sans Serif 10	Upper Case	2	18 Points Below TM Identification No. or Chapter/Section Title; 12 Points Above/Below Text, Table or Illustration; 12 Points Above/Below Warning, Caution and Note Headings
Subordinate Sideheads	Sans Serif 10	Upper and Lower Case	2	18 Points Below TM Identification No. or Chapter/Section Title; 12 Points Below Table or Illustration; 12 Points Below Warning, Caution and Note Headings
Figure No. and Title	Serif or Italic Bold 10	Upper case for First Letter of each Principal Word	2	18 Points Below Illustration; 6 Points Above Page Number
Legend Text	Sans Serif 8	Upper Case for First Letter of First Word	1	28 Points Above Illustration
Legend on Artwork	Sans Serif 8	Upper Case	1	As Required
Table No. and Title	Serif or Italic Bold 10	Upper case for First Letter of Each Principal Word	2	18 Points Above Table; 18 Points Below TM Identification No.
Boxhead Titles	Serif 10	Upper Case for First Letter of Each Principal Word	1	
Table Text	Serif 10	Upper and Lower Case	2	

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TABLE I. Style, Capitalization, Leading and Vertical Spacing - Continued.

Use	Type Style	Capitalization	Leading	Vertical Spacing
Rules	0.75 Point Width			
Footnotes	Serif 8	Upper and Lower Case	1	18 Points Below Text or Table
Warning and Caution Headings	Sans Serif Extra Bold 10 (Boxed)	Upper Case		12 Points Above and Below Text
Note Headings	Sans Serif Extra Bold 10	Upper Case		12 Points Above and Below Text
Maintenance Parts List, Numerical Index and Reference Designation Index Column Heads	Sans Serif 8	Upper Case	1	
Maintenance Parts List Text	Sans Serif 8 or 10	Upper and Lower Case	1	
Numerical Index and Reference Designation Index Text	Sans Serif 8	Upper and Lower Case	1	12 Points Space after Every Tenth Entry

All type sizes may be plus-or-minus one point.
Slight variations in spacing and leading are permitted.
Final reproducible copy shall use above type sizes.

IT IS NOT THE INTENT OF THIS STANDARD TO SPECIFY THE METHODS OR COMPOSING EQUIPMENT TO BE USED, BUT, ONLY TO SPECIFY REQUIRED RESULTS.

SECURITY CLASSIFICATION¹	
IDENTIFICATION NUMBER²	
FORMERLY XX-XXX-X-X³	
VOLUME NO./PART NO.⁴	REVISION NO.⁵
Title⁶ Block	TECHNICAL MANUAL⁷
	TYPE OF PUBLICATION⁸
	MAINTENANCE LEVEL(S)⁹
	NOMENCLATURE OF EQUIPMENT -¹⁰
	TYPE, MODEL, PART NUMBER,
	NATIONAL STOCK NUMBER
	OR SUBJECT
	SUBTITLE¹¹
	MANUFACTURER¹²
	CONTRACT NUMBER¹³
	NAVY SEAL¹⁴
	SUPERSEDURE NOTICE¹⁵
	SUPPLEMENT NOTICE¹⁶
	EFFECTIVE DATE NOTICE¹⁷
	VOLUME NOTICE¹⁸
	DISCLOSURE NOTICE¹⁹
	DISTRIBUTION STATEMENT²⁰
	EXPORT CONTROL NOTICE²¹
	DESTRUCTION NOTICE²²
	COPYRIGHT CREDIT LINE²³
	AUTHORITY NOTICE²⁴
DATE²⁵	CHANGE NO. - DATE²⁶
SECURITY CLASSIFICATION²⁷	

FIGURE 1. Example cover/title page.

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	<u>Notes</u>	<u>Type Size</u>
1.	The security classification assigned by the acquiring activity shall be as specified in DOD Manual 5200.1-R, Chapter IV or DOD 5220.22-M, Section 11-19, when the manual itself is classified.	24
2.	The acquiring activity shall furnish the TM identification number(s). If the manual will be jointly used by more than one Service, the acquiring Service's number shall appear at the top with the other Service's number immediately below it. Each Service's number shall be prefixed with the word Army, Navy, Marine Corps, or Air Force as appropriate. All numbers shall appear above the ruled line, near the right margin, except for Naval Sea Systems Command numbers, which shall be on the left margin.	24
3.	When a manual is renumbered, the former TM identification number shall appear below the new number, preceded by the word "Formerly". Both numbers shall remain at this location until the first revision, at which time only the new number shall be shown.	14
4.	Required for multivolume/multipart sets only, located below TM identification number.	14
5.	(N) Required when it is advisable to indicate status for publications subject to frequent revisions. Especially significant when the same TM identification numbers are maintained for superseding revisions identified by a change of the publication date.	14
6.	The title is required to provide all information necessary to relate the manual to its subject and content, such that readers can discern the applicability of the manuals and can discriminate between manuals of similar applicability. The title consists of a heading, the type of manual, the level of maintenance, the prime title, and subtitle as applicable.	
7.	The words TECHNICAL MANUAL shall appear in the upper center portion of the page, aircraft flight manuals excepted. When applicable, the word PRELIMINARY shall be centered above the words TECHNICAL MANUAL. For flight manuals, the appropriate term shall be used. Not required for Space and Naval Warfare Systems Command and Naval Sea Systems Command technical manuals.	14
8.	Required to define the specific type of technical manual (e.g. Maintenance Manual, Illustrated Parts Breakdown, Repair Parts and Special Tools List, Inspection Manual etc.)	14
9.	Required to define the specific intended level of maintenance, when the manual is restricted for use at a specified level.	14
10.	The prime title: nomenclature of the equipment, type, model, part number, (blocks, serial numbers, registration numbers, if appropriate), national stock number or	18

FIGURE 1. Example cover/title page - Continued.

<u>Notes</u>		Type Size
subject shall be positioned below the words identifying the manual type. Also, the classification of the equipment nomenclature shall be indicated as specified in DOD Manual 5200.1-R, Chapter IV or DOD 5220.22-M, Section 11-19, when the manual itself is classified.		
11.	Indicates the content covered. Required on multivolume/multipart publications to differentiate between the coverage among volumes.	14
12.	Identification of the manufacturer of the equipment shall appear below the equipment nomenclature.	8
13.	The original contract number for the equipment shall be placed on all new issues and carried forward on all subsequent title pages. If the contract number for a change or revision is different from the original number, the number applicable to the change or revision shall be indicated on any new title pages, in addition to the original number. No more than two contract numbers, the original and the latest, need appear.	8
14.	(N) The Department of the Navy seal, with Command identifier, is used.	1¼ - 1½ inches
15.	When a manual supersedes a previous issue, or another manual, a supersedure notice shall be placed in the space indicated.	8
16.	When a manual supplements, or is supplemented by, another manual, a supplement notice shall be placed in the space indicated.	8
17.	When a manual or change becomes effective later than the date upon which it is distributed, an effective date notice shall be placed in the space indicated.	8
18.	When a manual is one volume of a multivolume set, a volume notice shall be placed in the space indicated.	8
19.	When required, a disclosure notice shall be placed in the space indicated.	8
20.	The distribution statement shall be placed in the space indicated. (F) Add distribution statement after " <u>DISTRIBUTION STATEMENT</u> - ".	8
21.	When required, the export control notice shall be placed in the space indicated. (F) Add export control notice statement after " <u>WARNING</u> - ".	8
22.	The destruction notice shall be placed in the space indicated.	8
23.	When required, the copyright credit line shall be placed in the space indicated.	8

FIGURE 1. Example cover/title page - Continued.

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	<u>Notes</u>	<u>Type Size</u>
24.	Indicates the authority under which the manual is acquired and issued. It shall be placed on the cover/title page (not T-2). This statement will be furnished by the acquiring activity.	8
25.	The publication date; normally the copy freeze date.	18
26.	Change title pages shall show a change number and date.	14
27.	Same as 1.	24

Spacing between the necessary information shall be such as to result in an attractive, well balanced title page. Horizontal lines, one (1) point high, shall be placed across the page, one just below the TM identification number and the second just above the date.

When an abbreviated title followed by text on the same page is used instead of a cover/title page, the abbreviated title shall be confined to a 7 by 5 1/2 inch area. Type size shall be such that all the information can be included within the prescribed area. Abbreviated title pages shall be used only when specified by the acquiring activity.

FIGURE 1. Example cover/title page - Continued.

CHAPTER 1 GENERAL MAINTENANCE PROCEDURES

SECTION I HYDRAULIC SYSTEM

1.1 HYDRAULIC SYSTEM PERTINENT DATA.

Data pertinent to the operation and physical properties of the hydraulic system are provided in Table 1-1.

1.2 HYDRAULIC SYSTEM TUBING AND FITTINGS.

1.2.1 Titanium Tubing. Ti-3Al-2.3V titanium tubing is used for all pressure lines, return lines, all lines in high temperature areas and all flex lines. Titanium tubing is used because it is corrosion resistant, strong, lightweight and can withstand high temperatures.

1.2.2 Dynatube Fittings. Dynatube fittings are made of 6AL-3V titanium. They have a metal to metal seal that uses hydraulic pressure in the lines to increase sealing pressure. Dynatube fittings are used to meet the high temperature, high pressure, no leak requirements of aircraft hydraulic systems.

1.2.3 Permaswage Fittings. Permaswage fittings are made of 6AL-3V titanium. They provide permanent connections between line assemblies not disconnected during normal maintenance. The outside of the fitting is swaged. The swage is transferred to the outside of the tubing, providing a permanent seal.

1.3 HYDRAULIC LINE REMOVAL AND INSTALLATION.

Figure 1-1 shows the location of all aircraft hydraulic lines and connections. It also shows location and position of support clamps. Table 1-2 provides inspection/

replacement criteria. Table 1-3 provides torque values for all size lines.

1.3.1 Removal. Typical hydraulic line removal is as follows.

WARNING

Very high pressure is present in hydraulic lines when hydraulic system power is on. Ensure hydraulic system power is OFF prior to loosening or removing lines. Serious injury or death may result.

- a. Remove support clamps from hydraulic line(s). Inspect clamps and retain for use during assembly if undamaged.

CAUTION

Hydraulic lines may twist or flex during removal or installation. Use two wrenches to ensure lines are not twisted or flexed during removal. Failure of hydraulic lines may result.

- b. Using two wrenches, loosen dynatube fitting coupling nuts and remove hydraulic line(s).

Table 1-1. Hydraulic System Pertinent Data.

Feature	Operating Parameter
Hydraulic Fluid	MIL-H-83282
Nominal Operating Pressure	3000 Pounds per Square Inch (psi)
Fluid Capacity	5.3 Gallons
Reservoir Usable Fluid Capacity	1.7 Gallons
Reservoir 1 Shutoff Level	0.865 Gallons
Reservoir 2 Shutoff Level	0.416 Gallons
Filtration	
Pressure	23 Micron Absolute
Return	21 Micron Absolute

Change 2 1-1

FIGURE 2. Example typical TM page.

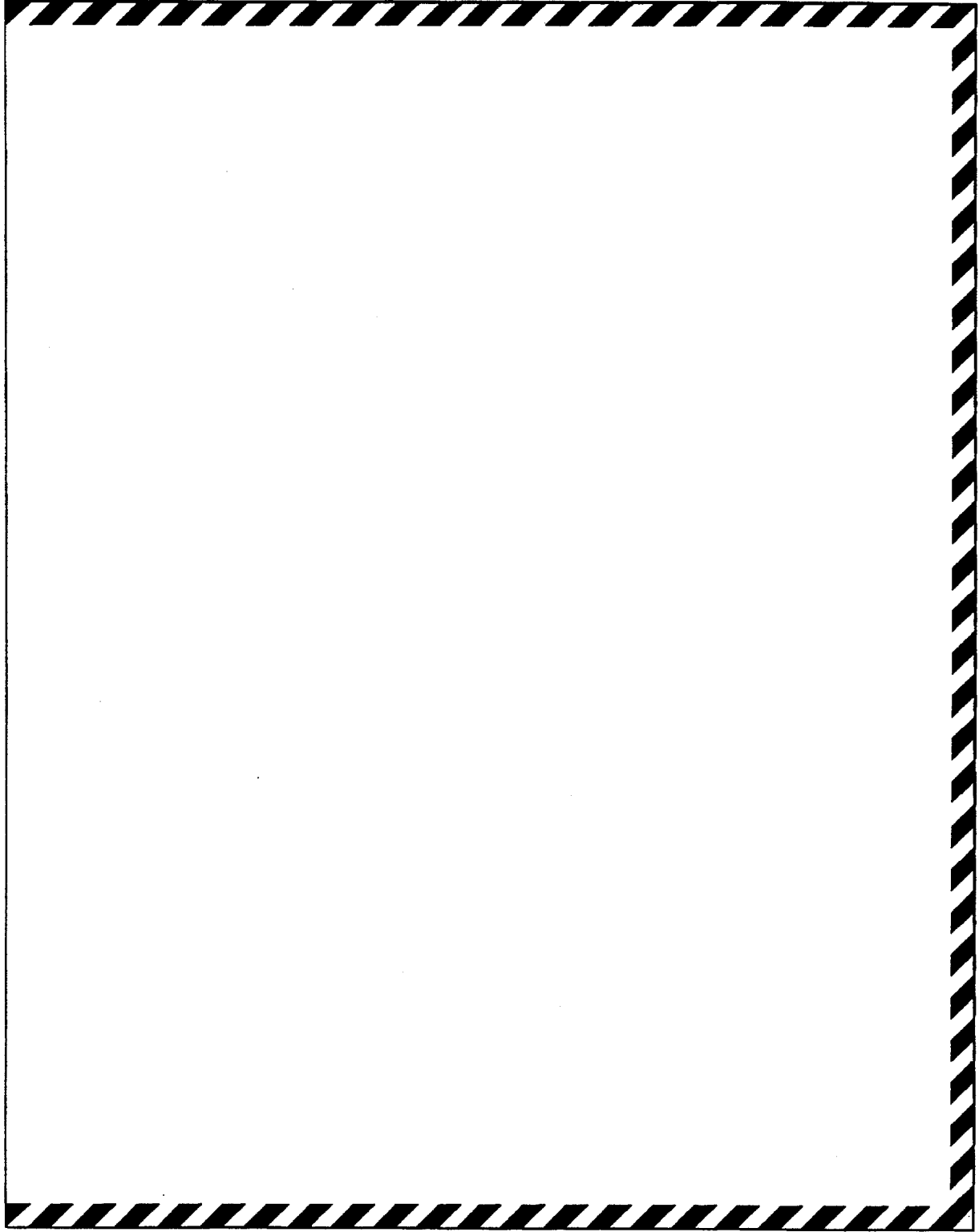


FIGURE 3. Example emergency page markings.

information on aircraft principal dimensions, aircraft stations using reference lines, and access provisions.

listed in Table 6-1. Refer to Figure 6-1 for three view illustration showing aircraft front, side and top.

Table 6-1. Aircraft Principal Data.

Item	Dimension
Aircraft	
Span	52'10"
Length ¹	73'9"
Height	28'8"
Maximum Takeoff Weight ²	53,400 pounds
Wing	
Span	52'10"
Chord at Root	311.5"
Chord at Tip	78.3"
Sweep (Leading Edge)	45°
Aspect Ratio	3.51
Stabilator	
Span	38'3"
Chord at Root	157.2"

See footnotes at end of table.

6-1

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Table 6-1. Aircraft Principal Data - Continued.

Item	Dimension
Stabilator - Continued	
Chord at Tip	47.5"
Sweep (Leading Edge) ³	50°
Aspect Ratio	2.55
Vertical Tail	
Chord at Root	125.0"
Chord at Tip	35.6"
Sweepback ³	44°44'
Aspect Ratio	1.89

¹ Length measured from tip of radome with no accessory pitot tubes installed. Consult TO XX-XXX-XX-X for information regarding pitot tubes.

² Maximum take off weight for normal configurations. See TO XX-XXX-XX-X for information regarding takeoff weight for special mission configurations.

³ Measured at root.

6.1.2 Reference Lines. Includes a system for locating units/components in relation to aircraft reference lines provide access to aircraft structure, systems or components for inspection, servicing and maintenance. Areas

FIGURE 4. Example typical continued table.

CHAPTER 1 GENERAL MAINTENANCE PROCEDURES

SECTION I HYDRAULIC SYSTEM

1.1 HYDRAULIC SYSTEM PERTINENT DATA. Data pertinent to the operation and physical properties of the hydraulic system are provided in Table 1-1.

Table 1-1. Hydraulic System Pertinent Data.

CUTLINE

1.2 HYDRAULIC SYSTEM TUBING AND FITTINGS.

1.2.1 Titanium Tubing. Ti-3Al-2.3V titanium tubing is used for all pressure lines, 0.25 inch return lines, all lines in high temperature areas and all flex lines. Titanium tubing is used because it is corrosion resistant, strong, lightweight and can withstand high temperatures.

1.2.2 Dynatube Fittings. Dynatube fittings are made of 6AL-3V titanium. They have a metal to metal seal that uses hydraulic pressure in the lines to increase sealing pressure. Dynatube fittings are used to meet the high temperature, high pressure, no leak requirements of aircraft hydraulic systems.

1.2.3 Permaswage Fittings. Permaswage fittings are made of 6AL-3V titanium. They provide permanent connections between line assemblies not disconnected during normal maintenance. The outside of the fitting is swaged. The swage is transferred to the outside of the tubing, providing a permanent seal.

1.3 HYDRAULIC LINE REMOVAL AND INSTALLATION.

Figure 1-1 shows the location of all aircraft hydraulic lines and connections. It also shows location and position of support clamps. Table 1-2 provides inspection/replacement criteria. Table 1-3 provides torque values for all size lines.

1.3.1 Removal. Typical hydraulic line removal is as follows.

WARNING

Very high pressure is present in hydraulic lines when hydraulic system power is on. Ensure hydraulic system power is OFF prior to loosening or removing lines. Serious injury or death may result.

- a. Remove support clamps from hydraulic line(s). Inspect clamps and retain for use during assembly if undamaged.

CAUTION

Hydraulic lines may twist or flex during removal or installation. Use two wrenches to ensure lines

FIGURE 5. Example typical RDC page.

Legend for Figure 1-1:

- | | |
|------------------------------------------|--------------------------------------------|
| 1. Screw, phillips head, 4-40 x 1/2-inch | 8. Indicator light cover |
| 2. Plate | 9. Maltese cross indicator light |
| 3. Lockwasher, internal star, 1/4-inch | 10. Screw, phillips head, 4-40 x 3/4-inch |
| 4. Trigger guard | 11. Battery test button |
| 5. Relay | 12. Wiring harness |
| 6. Connector | 13. Screw, phillips head, 4-40 x 3/16-inch |
| 7. Indicator light shell | |

Figure 1-1. GCU Wiring Tester - Exploded View. (illustration
identification number)

CUTLINE

FIGURE 6. Example figure cutline with legend.

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1.3 PRIMARY SIDEHEAD.

This is a primary paragraph. Primary sideheads stand alone. Primary sideheads may be followed by one, AND ONLY ONE, unnumbered paragraph of text. A primary sidehead or paragraph may be followed by a first subordinate paragraph or a first level procedural step. In Technical Manuals (TM), a paragraph is considered one block of text, not several blocks of text.

1.3.1 First Subordinate Sidehead. This is a first subordinate paragraph. The text is run in with the title and carry over lines return to the left margin. A first subordinate paragraph may be followed by another first subordinate paragraph, a second subordinate paragraph or a first level procedural step.

1.3.1.1 Second Subordinate Sidehead. This is a second subordinate paragraph. Second subordinate paragraphs should, but are not required to, have a title. The text is run in with the title and carry over lines return to the left margin. A second subordinate paragraph may be followed by another second subordinate paragraph, a third subordinate paragraph or a first level procedural step.

1.3.1.1.1 Third Subordinate Sidehead. This is a third subordinate paragraph. Third subordinate paragraphs should, but are not required to, have a title. The text is run in with the title and carry over lines return to the left margin. A third subordinate paragraph may be followed by another third subordinate paragraph or a first level procedural step.

1.4 PRIMARY PARAGRAPH FOLLOWED BY PROCEDURAL STEPS.

- a. This is a first level procedural step. Steps do not have titles. The step letter (alpha character) is indented two spaces from the left margin. The text is indented an additional two spaces and is blocked. A first level procedural step may be followed by a series of first level procedural steps or a series of second level procedural steps.
- (1) This is a second level procedural step. Steps do not have titles. The step number is indented four spaces from the left margin. The text is indented an additional two spaces and is blocked. A second level procedural step may be followed by a series of second level procedural steps or a series of third level procedural steps.
- (a) This is a third level procedural step. Steps do not have titles. The step letter (alpha character) is indented six spaces from the left margin. The text is indented an additional two spaces and is blocked. A third level procedural step may be followed by a series of third level procedural steps or a series of fourth level procedural steps.

- 1 This is a fourth level procedural step. Steps do not have titles. The step number is indented eight spaces from the left margin. The text is indented an additional two spaces and is blocked. A fourth level procedural step may be followed by a series of fourth level procedural steps.

1.5 PRIMARY SIDEHEAD.

1.5.1 First Subordinate Sidehead. First subordinate sidehead followed by procedural steps.

- a. This is a first level procedural step. Steps are block indented.
- (1) This is a second level procedural step. Steps are block indented.
- (a) This is a third level procedural step. Steps are block indented.
- 1 This is a fourth level procedural step. Steps are block indented.

1.6 PRIMARY SIDEHEAD.

1.6.1 First Subordinate Sidehead. First subordinate sidehead followed by second subordinate sidehead.

1.6.1.1 Second Subordinate Sidehead. Second subordinate sidehead followed by procedural steps.

- a. This is a first level procedural step. Steps are block indented.
- (1) This is a second level procedural step. Steps are block indented.
- (a) This is a third level procedural step. Steps are block indented.
- 1 This is a fourth level procedural step. Steps are block indented.

1.7 PRIMARY SIDEHEAD.

1.7.1 First Subordinate Sidehead. First subordinate sidehead followed by second subordinate sidehead.

1.7.1.1 Second Subordinate Sidehead. Second subordinate sidehead followed by a third subordinate sidehead.

1.7.1.1.1 Third Subordinate Sidehead. Third subordinate sidehead followed by procedural steps.

- a. This is a first level procedural step. Steps are block indented.
- (1) This is a second level procedural step. Steps are block indented.

1-3

FIGURE 7. Example decimal paragraph numbering.

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- (a) This is a third level procedural step. Steps are block indented.

- 1 This is a fourth level procedural step. Steps are block indented.

1.8 PRIMARY SIDEHEAD.

Primary paragraph followed by an added primary paragraph.

1.8A ADDED PRIMARY SIDEHEAD.

This paragraph shows numbering for added primary paragraphs.

1.8B ADDED PRIMARY SIDEHEAD.

This paragraph shows numbering for added primary paragraphs.

1.9 PRIMARY SIDEHEAD.

1.9.1 First Subordinate Sidehead. First subordinate paragraph followed by an added first subordinate paragraph.

1.9.1A Added First Subordinate Sidehead. This paragraph shows numbering for added first subordinate paragraphs.

1.9.1B Added First Subordinate Sidehead. This paragraph shows numbering for added first subordinate paragraphs.

1.9.2 First Subordinate Sidehead. First subordinate paragraph following an added first subordinate paragraph.

1.9.2.1 Second Subordinate Sidehead. Second subordinate paragraph followed by an added second subordinate paragraph.

1.9.2.1A Added Second Subordinate Sidehead. This paragraph shows numbering for added second subordinate paragraphs.

1.9.2.1B Added Second Subordinate Sidehead. This paragraph shows numbering for added second subordinate paragraphs.

1.9.2.2 Second Subordinate Sidehead. Second subordinate paragraph following an added second subordinate paragraph.

1.9.2.2.1 Third Subordinate Sidehead. Third subordinate paragraph followed by an added third subordinate paragraph.

1.9.2.2.1A Added Third Subordinate Sidehead. This paragraph shows numbering for added third subordinate paragraphs.

1-4

1.9.2.2.1B Added Third Subordinate Sidehead. This paragraph shows numbering for added third subordinate paragraphs.

1.9.2.2.2 Third Subordinate Sidehead. Third subordinate paragraph following an added third subordinate paragraph.

- a. First level procedural step followed by an added first level procedural step.

- a1. Added first level procedural step. This step shows numbering of added first level procedural steps.

- a2. Added first level procedural step. Step shows numbering of added first level procedural steps.

- b. First level procedural step following an added first level procedural step.

- (1) Second level procedural step followed by an added second level procedural step.

- (1A) Added second level procedural step. This step shows numbering of added second level procedural steps.

- (1B) Added second level procedural step. This step shows numbering of added second level procedural steps.

- (2) Second level procedural step following an added second level procedural step.

- (a) Third level procedural step followed by an added third level procedural step.

- (a1) Added third level procedural step. This step shows numbering of added third level procedural steps.

- (a2) Added third level procedural step. This step shows numbering of added third level procedural steps.

- (b) Third level procedural step following an added third level procedural step.

- 1 Fourth level procedural step followed by an added fourth level procedural step.

- 1A Added fourth level procedural step. This step shows numbering of added fourth level procedural steps.

- 1B Added fourth level procedural step. This step shows numbering of added fourth level procedural steps.

- 2 Fourth level procedural step following an added fourth level procedural step.

FIGURE 7. Example decimal paragraph numbering - Continued.

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	Index 1

FIGURE 8. Example alphabetical index.

WARNINGS, CAUTIONS and NOTES. Warning, Caution and Note headings and their definitions are as follows:

WARNING

OR

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which, if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

CAUTION

OR

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

FIGURE 9. Example warnings, cautions, and notes.

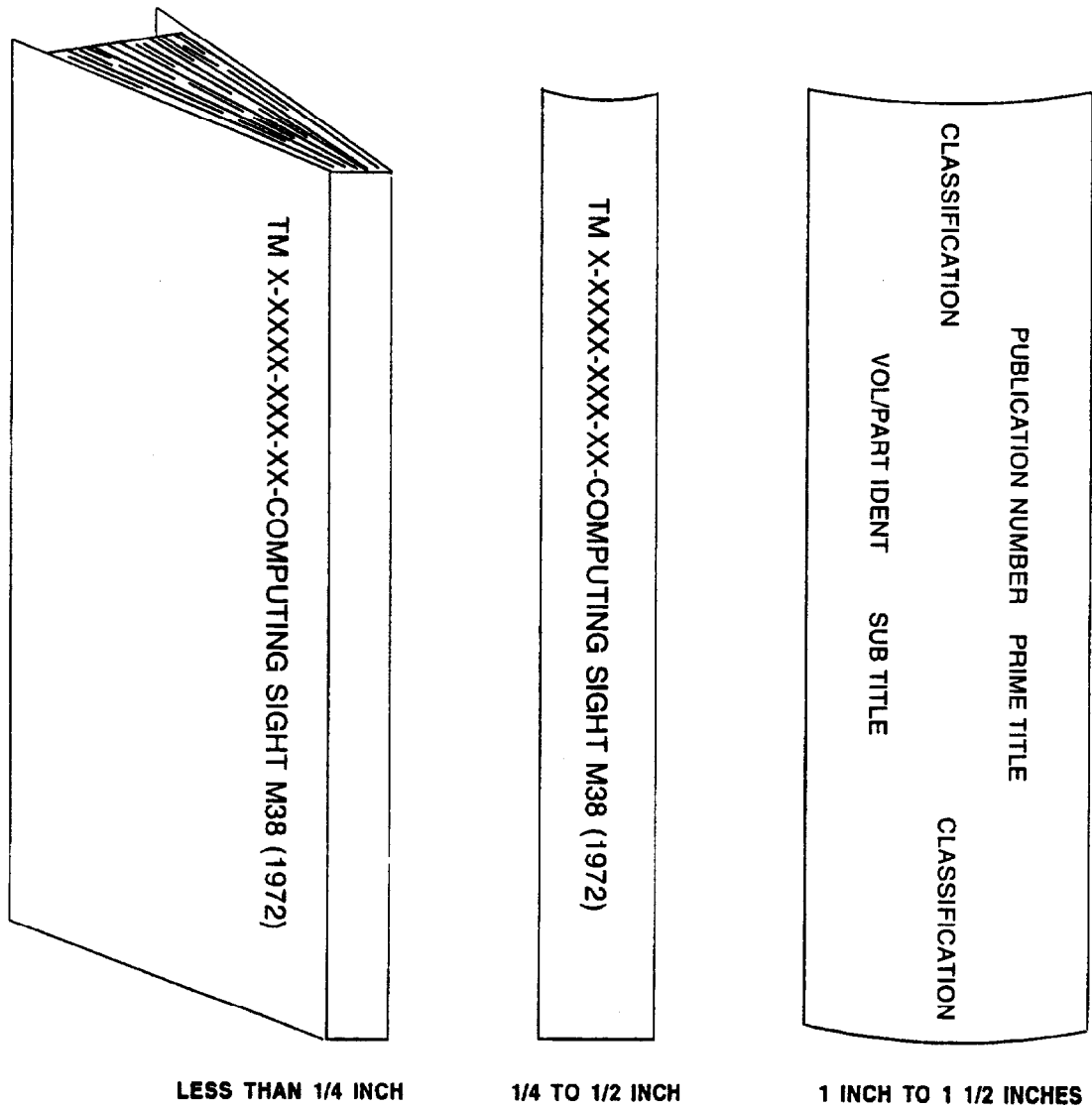


FIGURE 10. Example backbone for binder or cover.

IDENTIFICATION NUMBER

This manual supersedes TO XX-XXX-XX-X dated 16 April 1991, Change 4 dated 14 November 1993, including Operational Supplements TO XX-XXX-XX-XS-1 dated 6 August 1991 and TO XX-XXX-XX-XS-2 dated 9 January 1993, and TOPS TO XX-XXX-XX-XTP-1 dated 12 December 1993.

This manual supplements TO XX-XXX-XX-XX dated 4 September 1992.

This manual is incomplete without Volumes X thru XX.

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FIGURE 11. Example T-2 page.

WARNING RADIATION HAZARD



Co 60

Tube types OA2 and 6530/PL-35 (TR tubes) used in this equipment contain radioactive material (para 0-0). These tubes are potentially hazardous when broken; see qualified medical personnel and the Safety Director if you are exposed to or cut by broken tubes. For first aid instructions see TB 750-237 and AR 755-15. Use extreme care in replacing these tubes (para 0-0) and follow safe procedures in their handling, storage, and disposal (para 0-0). Refer to paragraph 0-0 and to TB 750-237 and AR 755-15 for instructions on handling, storage, and disposal of radioactive material.

Never place radioactive tubes in your pocket.

Use extreme care not to break radioactive tubes while handling them.

Never remove radioactive tubes from cartons until ready to use them.

SAMPLE A

ELECTROMAGNETIC RADIATION

**DO NOT STAND IN THE DIRECT PATH OF THE ANTENNA
WHEN THE POWER IS ON! DO NOT WORK ON THE WAVE
GUIDES WHILE THE POWER IS ON!**

High frequency electromagnetic radiation can cause fatal internal burns. It can literally "cook" internal organs and flesh. If you feel the slightest warming effect while near this equipment **MOVE AWAY QUICKLY!**

SAMPLE B

FIGURE 12. Example warnings for warning page.

WARNING
RADIATION HAZARD

This equipment contains the following radioactive tubes:
(List applicable tubes and equipment locations)
Radiation may be present at unsealed or broken waveguide elements.

Sample C

WARNING
DANGEROUS CHEMICALS

are used in this equipment.
DEATH
or severe burns may result if personnel fail to observe safety precautions.

Sample D

WARNING
HIGH VOLTAGE

is used in the operation of this equipment.
DEATH ON CONTACT
may result if personnel fail to observe safety precautions.
Learn the areas containing high voltage in each piece of equipment.
Be careful not to contact high voltage connections when installing or operating
this equipment.
Before working inside the equipment, turn power off and ground points of high
voltage potential before touching them.

Sample E

WARNING
GASES OR AIR UNDER PRESSURE
3000 PSI AIR PRESSURE

is used in the operation of this equipment.
DEATH
or severe injury may result if personnel fail to observe safety precautions.

Sample F

FIGURE 12. Example warnings for warning page - Continued.

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LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

NOTE The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by shaded or screened areas, or by miniature pointing hands.

Dates of issue for original and changed pages are:

Original	0	1 January 1991	Change	4	6 July 1992
Change	1	19 September 1991	Change	5	25 September 1992
Change	2	20 December 1991	Change	6	29 March 1993
Change	3	21 February 1992	Change	7	15 February 1994

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*Zero in this column indicates an original page

A Change 7

USAF

FIGURE 13. Example list of effective pages.

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WARNING

This manual contains unverified procedures. Unverified procedures shall only be performed during verification, in accordance with TOs 00-5-1 and 00-5-3. Performance of unverified procedures may result in injury to personnel or damage to equipment.

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Function/Para/ Figure etc.	Verification Status	Date Verified	Remarks
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FIGURE 14. Example verification status page.

CHANGE NO.	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY

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FIGURE 16. (F)(M)(N) Example table of contents.

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TM 9-1440-1585-20-1

TECHNICAL MANUAL

No. 9-1440-1585-20-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 31 August 1991

Organizational Maintenance Manual
for
Launching Station M54A1
Maintenance and Check Procedures
IMPROVED CHAPARRAL INTERCEPT-AERIAL GUIDED MISSILE SYSTEM

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual directly to Commander, U.S. Army Missile Command, ATTN: DRSMI-SNPM, Redstone Arsenal, Alabama 35898. A reply will be furnished to you.

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FIGURE 17. (A) Example table of contents.

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Number	Title	Page	Number	Title	Page
1-1	Aircraft General Arrangement	1-2	4-2	Main Landing Gear Jacking	4-3
1-2	Air Conditioning System Components . .	1-4	4-3	Aircraft (Fuselage) Jacking	4-4
1-3	Flight Control System Components . . .	1-6	4-4	Aircraft Lifting	4-5
1-4	Landing Gear System Components	1-8	5-1	Aircraft Leveling	5-2
1-5	Power Plant System Components	1-11	6-1	Personnel Requirements For Towing . .	6-2
1-6	Engine Starting System Components . . .	1-12	7-1	Aircraft Mooring	7-2
1-7	Engine Starting System Block Diagram . .	1-13	8-1	Servicing and Handling Markings	8-2
3-1	Aircraft Dimensions	3-2	8-2	Tubing, Hose and Line Identification . .	8-3
3-2	Aircraft Fuselage Stations, Water Lines, and Butt Lines	3-4	8-3	Wire Identification	8-4
3-3	Internal Access Doors	3-5	8-4	Aircraft Drains and Vents	8-5
4-1	Nose Landing Gear Jacking	4-2	9-1	Servicing Chart	9-3

LIST OF TABLES

Number	Title	Page	Number	Title	Page
1-1	Safety and Protective Devices	1-14	9-1	Liquid and Gaseous Servicing Require- ments and System Capacities	9-1
3-1	Aircraft Principal Data	3-1	9-2	Hydraulic Components External Leak- age Limits	9-4
4-1	Jacking Equipment	4-2	9-3	Fuel Tank Capacities	9-5
4-2	Jacking Limits	4-2	9-4	Hydraulic System Capacities	9-6
4-3	Recovery Equipment	4-13			
5-1	Weight Limits	5-1			

FIGURE 18. Example list of illustrations and list of tables.

SAFETY SUMMARY

1. GENERAL SAFETY INSTRUCTIONS.

This manual describes physical and chemical processes which may cause injury or death to personnel, or damage to equipment if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any task, the WARNINGS, CAUTIONS and NOTES included in that task shall be reviewed and understood.

2. WARNINGS, CAUTIONS AND NOTES.

WARNINGS and CAUTIONS are used in this manual to highlight operating or maintenance procedures, practices, conditions or statements which are considered essential to protection of personnel (WARNING) or equipment (CAUTION). WARNINGS and CAUTIONS immediately precede the step or procedure to which they apply. WARNINGS and CAUTIONS consist of four parts: heading (WARNING, CAUTION or Icon [see HAZARDOUS MATERIALS WARNINGS]), a statement of the hazard, minimum precautions, and possible result if disregarded. NOTES are used in this manual to highlight operating or maintenance procedures, practices, conditions or statements which are not essential to protection of personnel or equipment. NOTES may precede or follow the step or procedure, depending upon the information to be highlighted. The headings used and their definitions are as follows.

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc, which, if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

3. HAZARDOUS MATERIALS WARNINGS.

Hazardous Materials Warnings in this manual are provided through use of the Hazard Symbols listed below. Consult the HAZARDOUS MATERIALS DESCRIPTION below or Material Safety Data Sheets (MSDS) (Occupational Safety and Health Administration [OSHA] Form 20 or equivalent) for specific information on hazards, effects, and protective equipment requirements. If you do not have an MSDS for the material involved, contact your supervisor, or the base Safety or Bioenvironmental Engineering Offices.

3.1 Hazardous Materials Icons. Icons are used in this manual to identify dangers associated with hazardous materials. The icons used and their definitions are as follows.



The abstract symbol bug shows that a material may contain bacteria or viruses that present a danger to life or health.



The symbol of drops of liquid onto a hand shows that the material will cause burns or irritation of skin and tissue.



The rapidly expanding symbol shows that the material may explode if subjected to high temperatures, sources of ignition or high pressure.



The symbol of a person wearing goggles shows that the material will injure eyes.



The symbol of a flame shows that the material can ignite and burn.



The symbol of a skull and crossbones shows that the material is poisonous or a danger to life.



The symbol of three circular wedges shows that radioactive energy is emitted which can injure tissue and organs.



The symbol of a human figure in a cloud shows that the material gives off vapors that are a danger to life or health.

3.2 Hazardous Materials Description. The following hazardous materials are used in this manual. Each icon represents certain hazards as described above. Beneath the icons is the hazardous material name and a reference number. Below the icons, material name,

FIGURE 19. Example safety summary.

TO XX-XXX-XX-X

and reference number is a description of the hazardous material. Only the icons, material name, and reference number are used in the text of the manual. If a full description of the hazardous material is required while performing procedures in this manual, use the reference number to locate the appropriate description below.

**THREAD COMPOUND, MIL-C-38736**

1

Thread Compound, MIL-C-38736, is flammable and toxic to eyes, skin and respiratory tract. Skin and eye protection required. Avoid repeated or prolonged exposure. Keep Thread Compound, MIL-C-38736, off skin, eyes, and clothes; do not breathe vapors. Keep away from open flames or other sources of ignition.

**AMINE ACID HALOGENATED ORGANIC SOLVENT, MIL-S-4784**

2

Amine Acid Halogenated Organic Solvent, MIL-S-4784, contains trace amounts of bacteria and is toxic to eyes, skin and respiratory tract. Respirator, skin and eye protection required. Keep Amine Acid Halogenated Organic Solvent, MIL-S-4784, off skin, eyes, and clothes; do not breathe vapors. Keep away from open flames or other sources of ignition.

**ELECTRON TUBE, OA2**

3

Electron Tube, OA2, contains radioactive material. Avoid repeated or prolonged exposure. TO XX-XXX-XX lists protective equipment required and provides instructions for safe handling and disposal of radioactive tubes.

4. SAFETY PRECAUTIONS.

The following safety precautions shall be observed while performing procedures in this manual.

- Dangerous voltages are present at system connectors. Ensure power is OFF prior to connecting or disconnecting cables.
- Do not wear metal frame glasses, rings, watches, or other metal jewelry while working on electronic equipment.
- Some cleaning materials specified herein are flammable and/or toxic. Keep away from open flame or other ignition sources. Provide adequate ventilation and avoid skin/eye exposure.
- Cleaning with compressed air can create airborne particles that may enter eyes or penetrate skin. Pressure shall not exceed 30 psig. Wear goggles. Do not direct compressed air against skin.

x

FIGURE 19. Example safety summary - Continued.

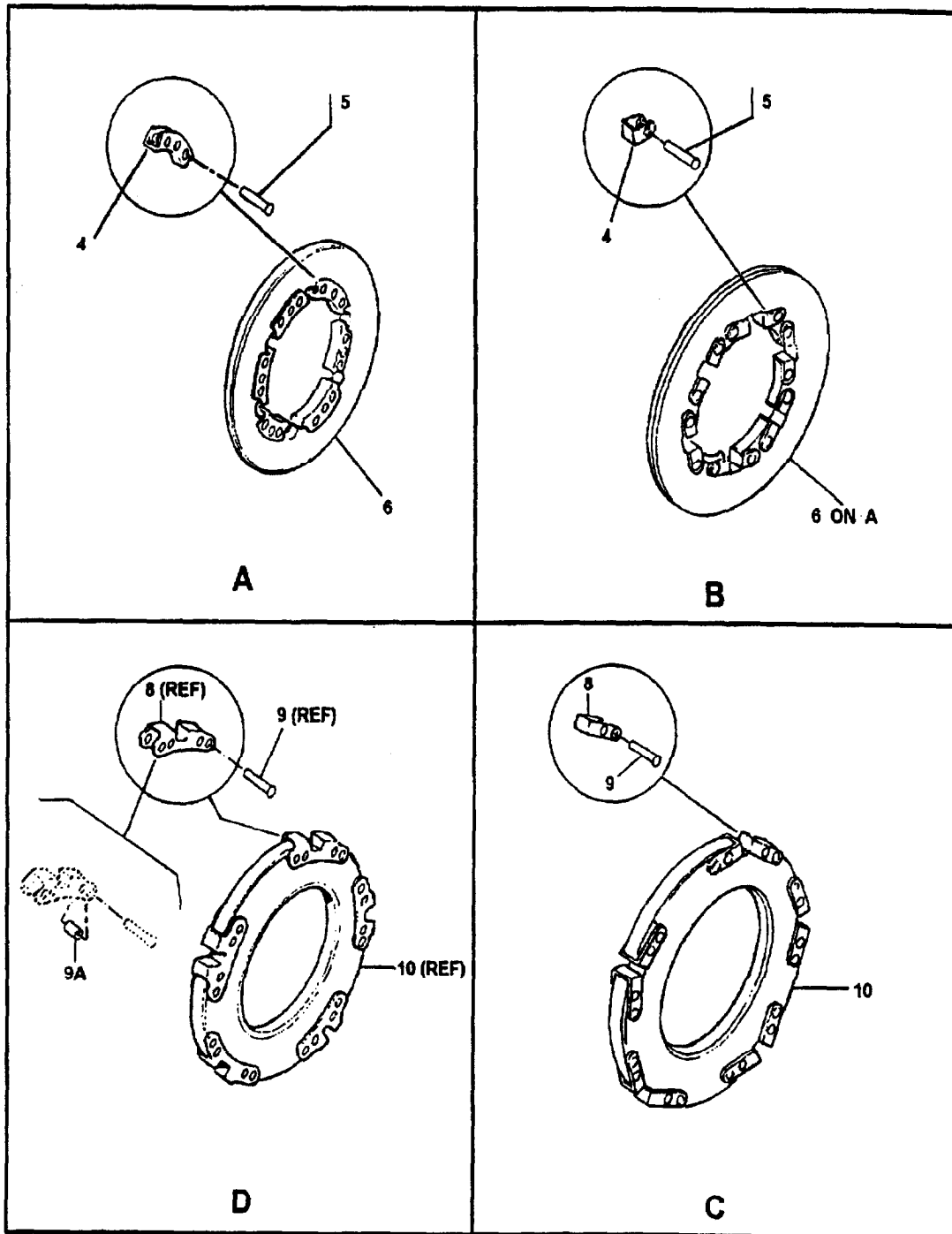


FIGURE 20. Example multisection illustration.

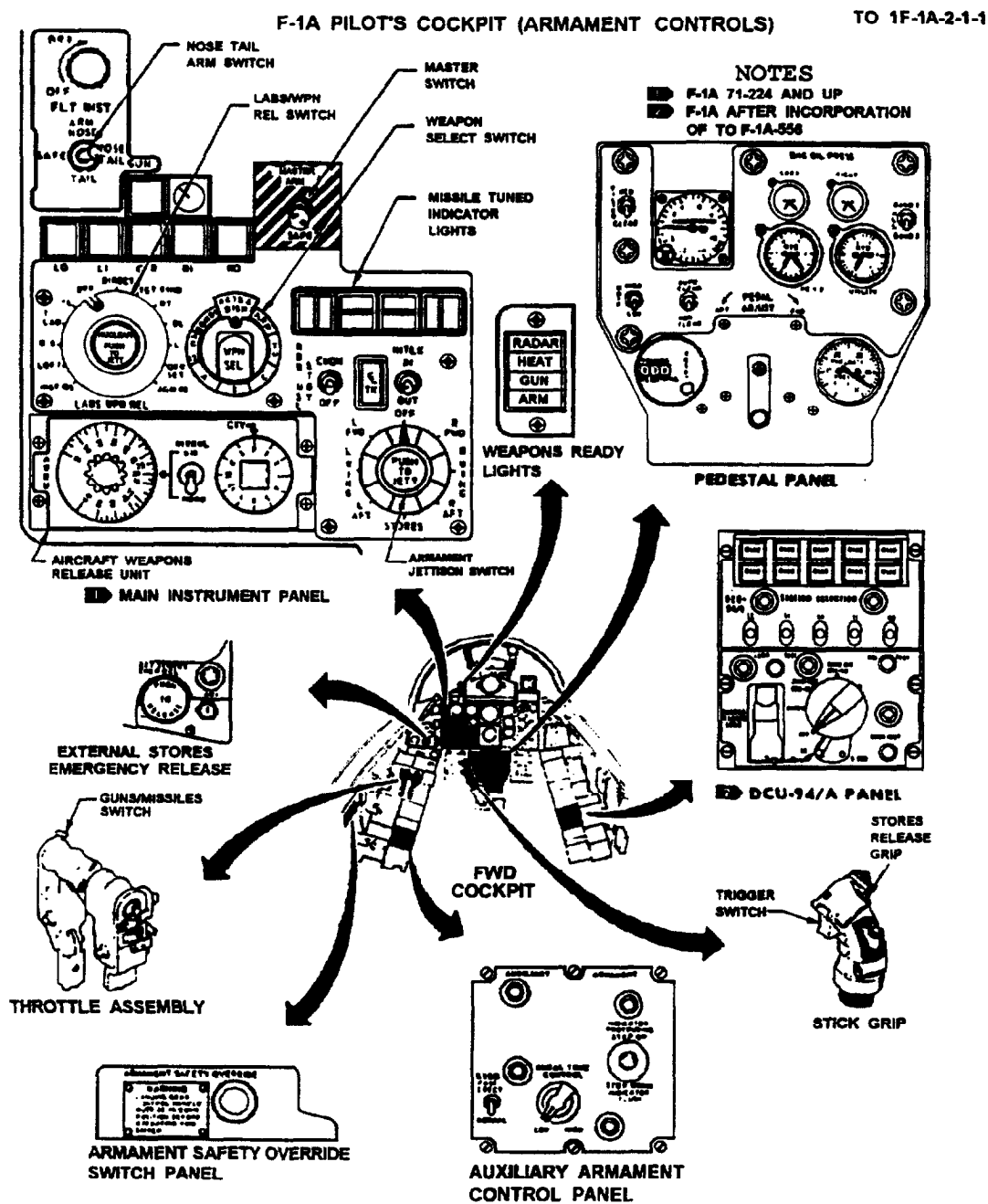


FIGURE 21. Example functional illustration - location view.

MIL-STD-38748D

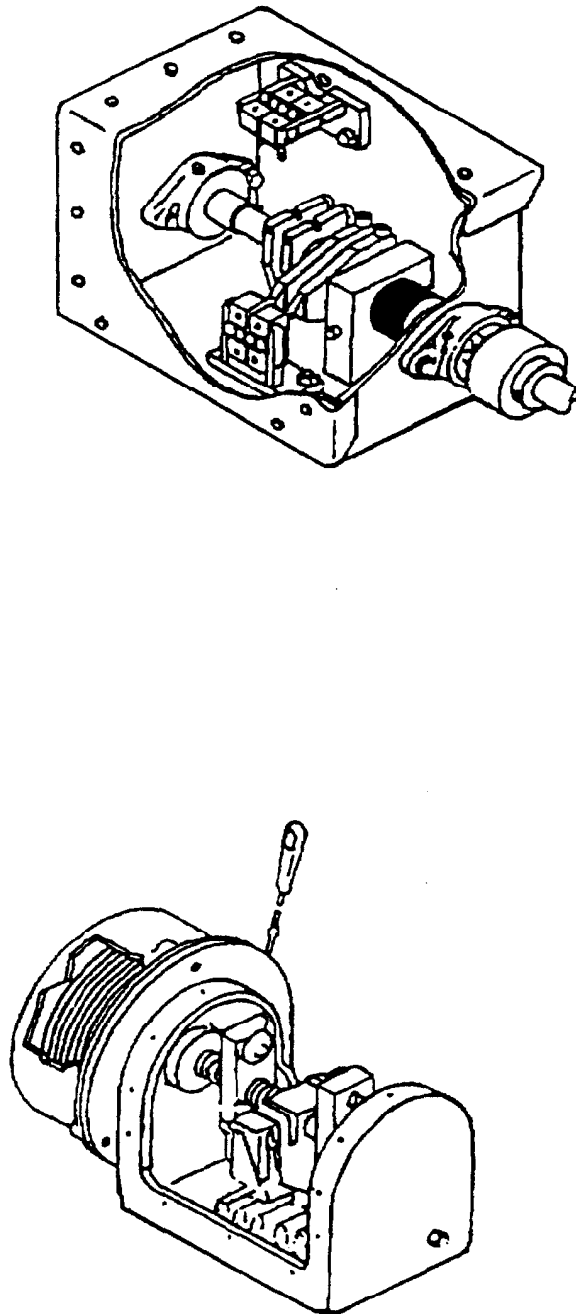


FIGURE 22. Example cutaway illustrations.

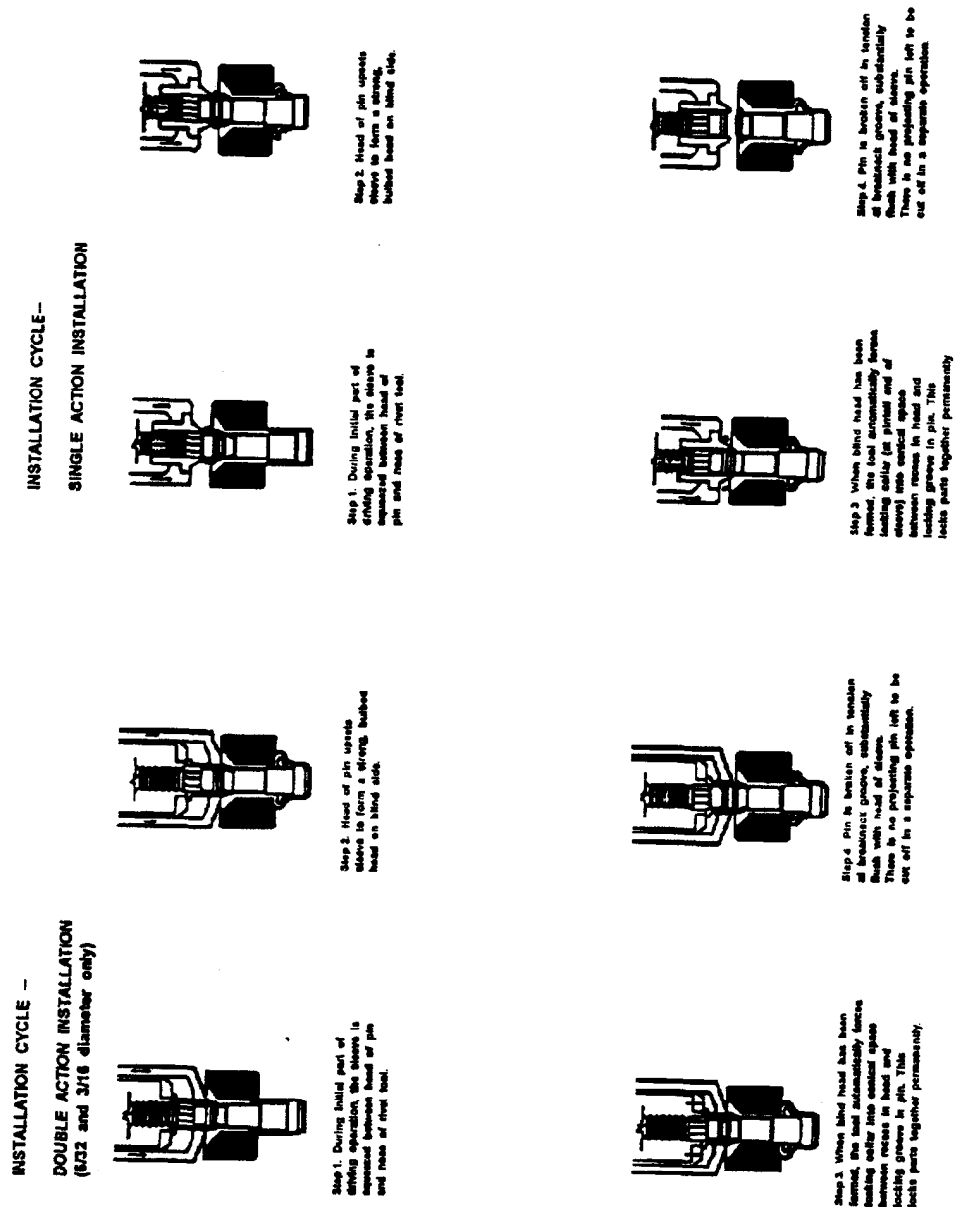
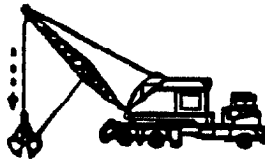


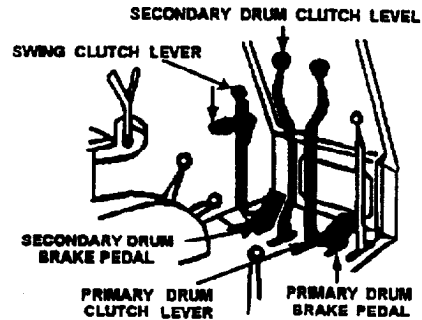
FIGURE 23. Example procedural illustrations.

FILLING THE CLAMSHELL

Pull back on the drum clutch levers until the clamshell bucket is high enough to clear the material being moved. Then push the drum clutch levers to neutral position, applying both brake pedals, swing clamshell over material.

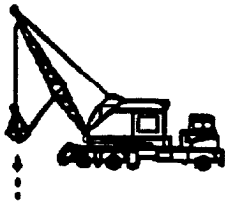


Release the secondary drum brake pedal to open clamshell bucket, then release primary drum brake pedal to lower clamshell bucket over material.

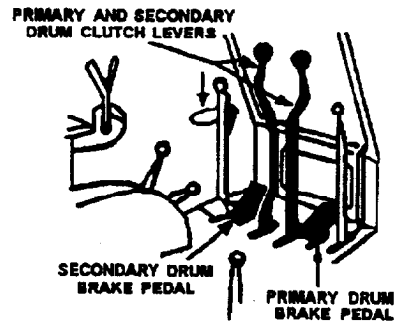


CLOSING AND HOISTING

To close the clamshell bucket pull back on the secondary drum clutch lever. Hold the lever until the bucket is filled with material and closed. When the bucket is closed, release the primary drum brake pedal and pull the primary drum clutch lever back.

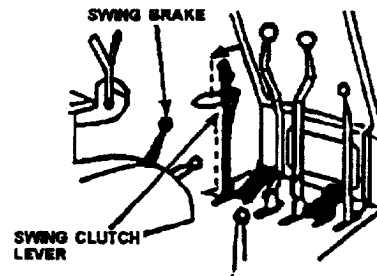


Hold both levers back until the load has reached the desired height. Return both drum clutch levers to neutral and at the same time apply both drum brake pedals.



SWINGING

Push the swing clutch lever forward to swing the crane to the left. Pull it to the rear to go to the right. Swing slowly and evenly to avoid bucket whipping. When handling fine materials, keep load on secondary line but coordinate primary drum to avoid excessive slack in the primary line.



DUMPING

To dump the bucket, release the secondary drum brake pedal.

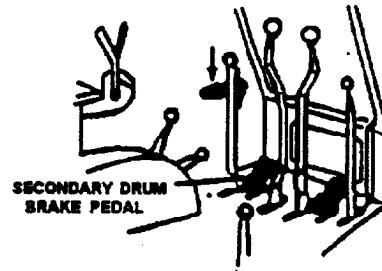
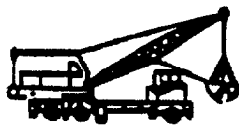


FIGURE 24. Example operational illustrations.

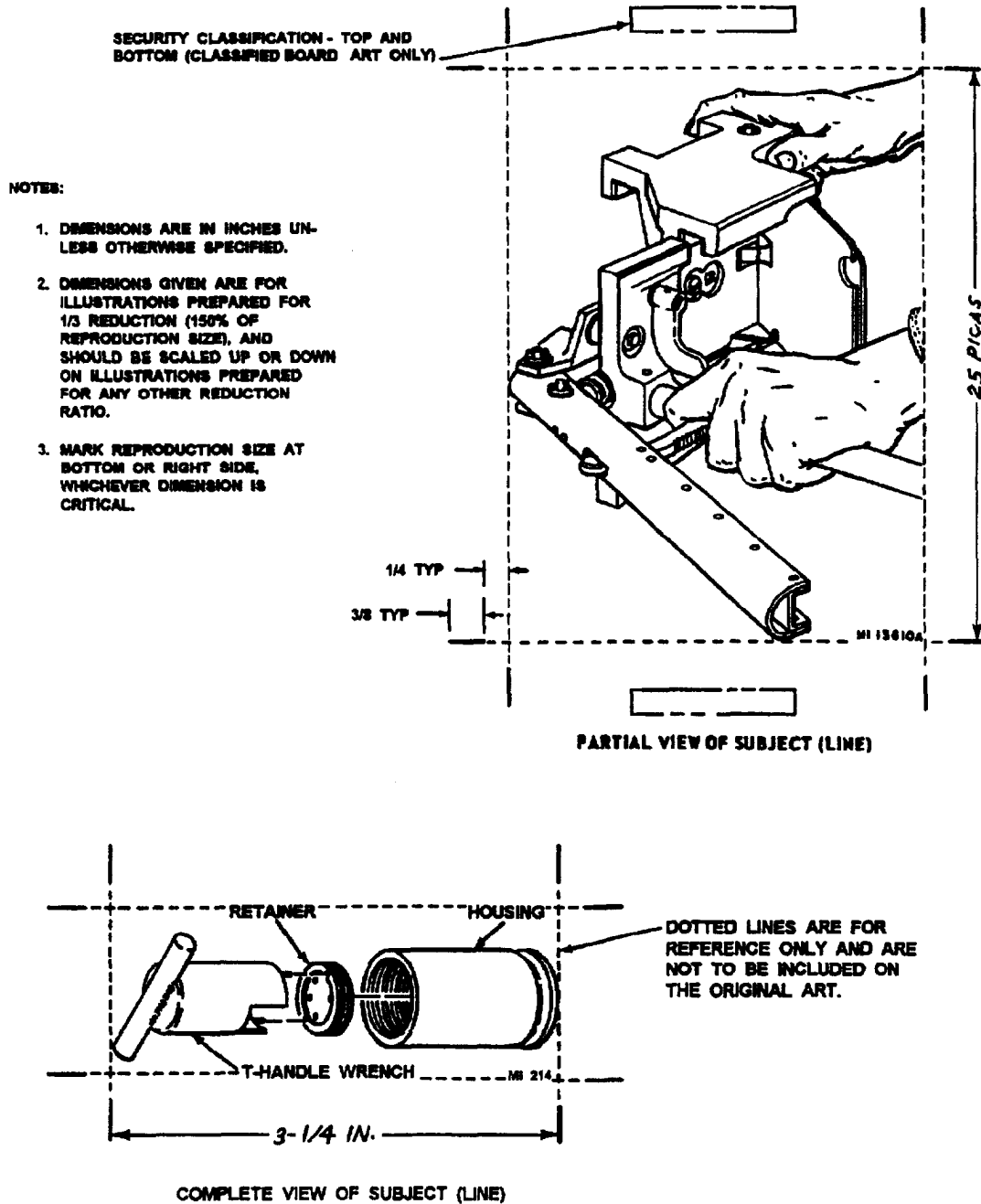


FIGURE 25. Cropping and sizing of illustrations.

MIL-STD-38784D

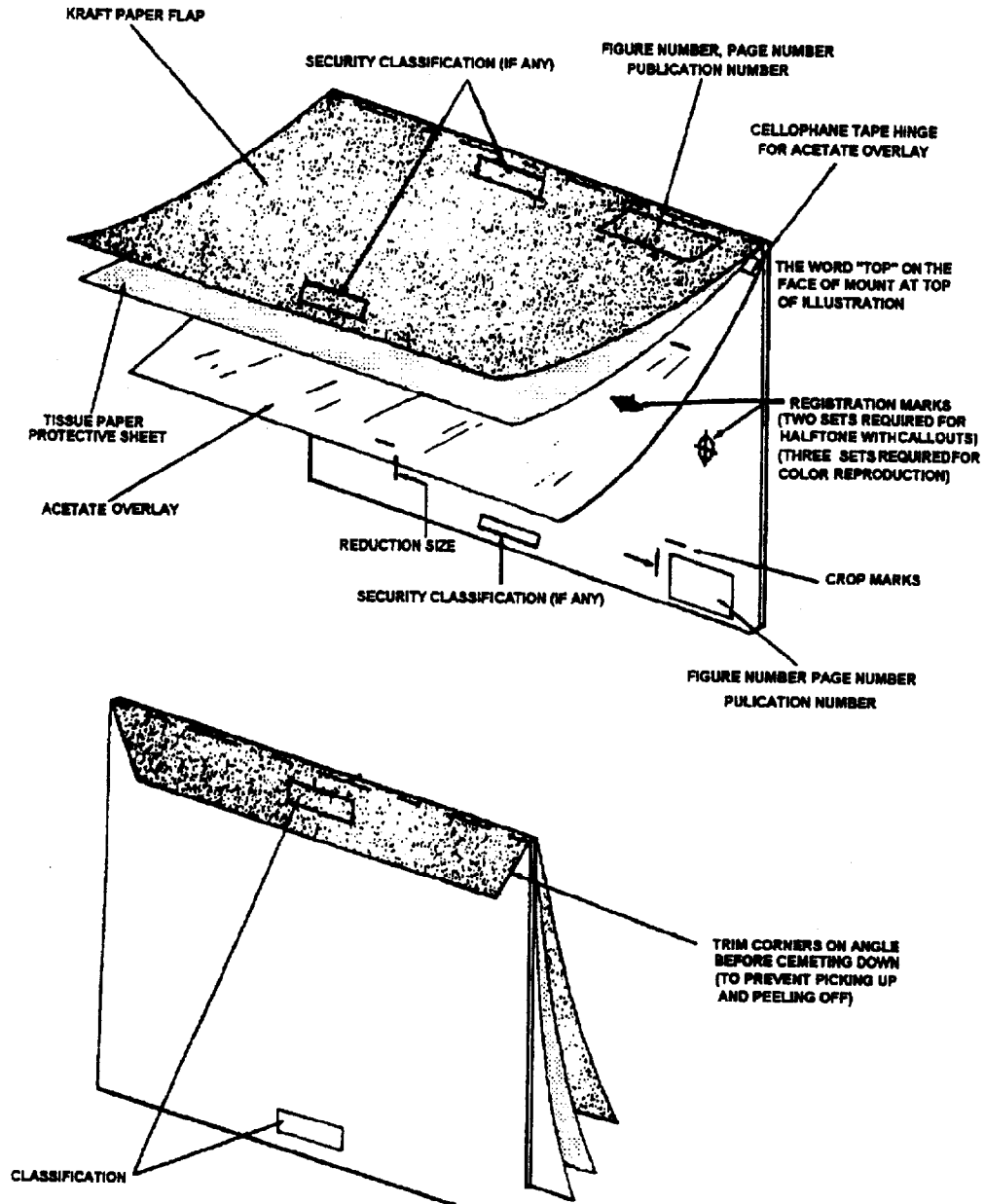


FIGURE 26. Identification, marking, and protective covering of artwork.

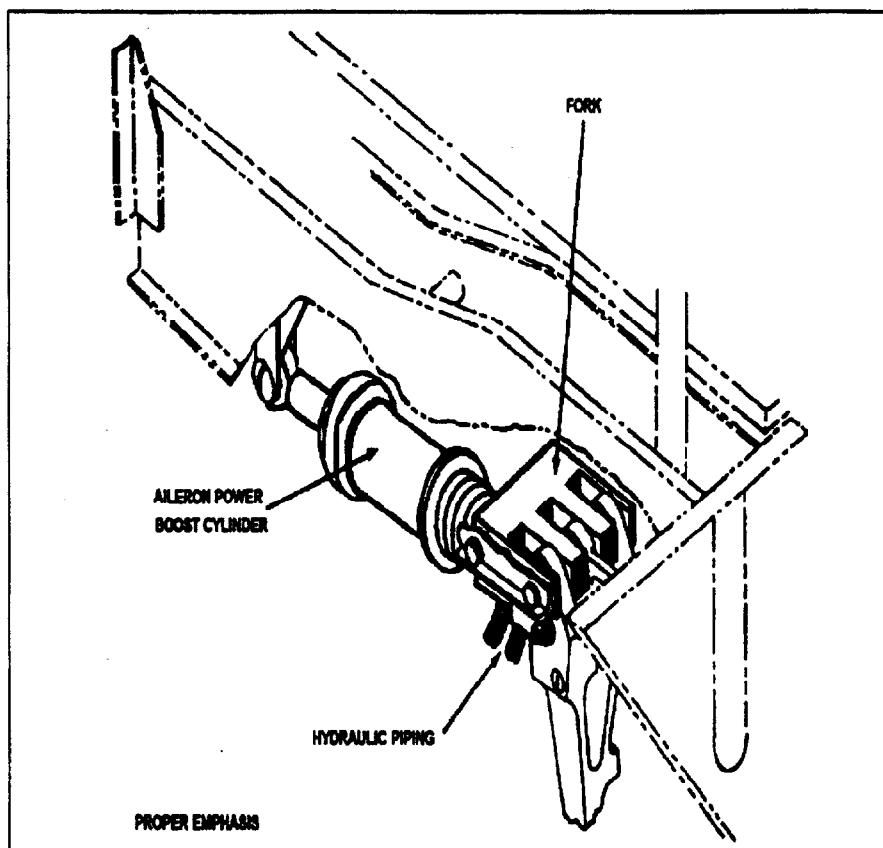


FIGURE 27. Emphasis and subordination of detail.

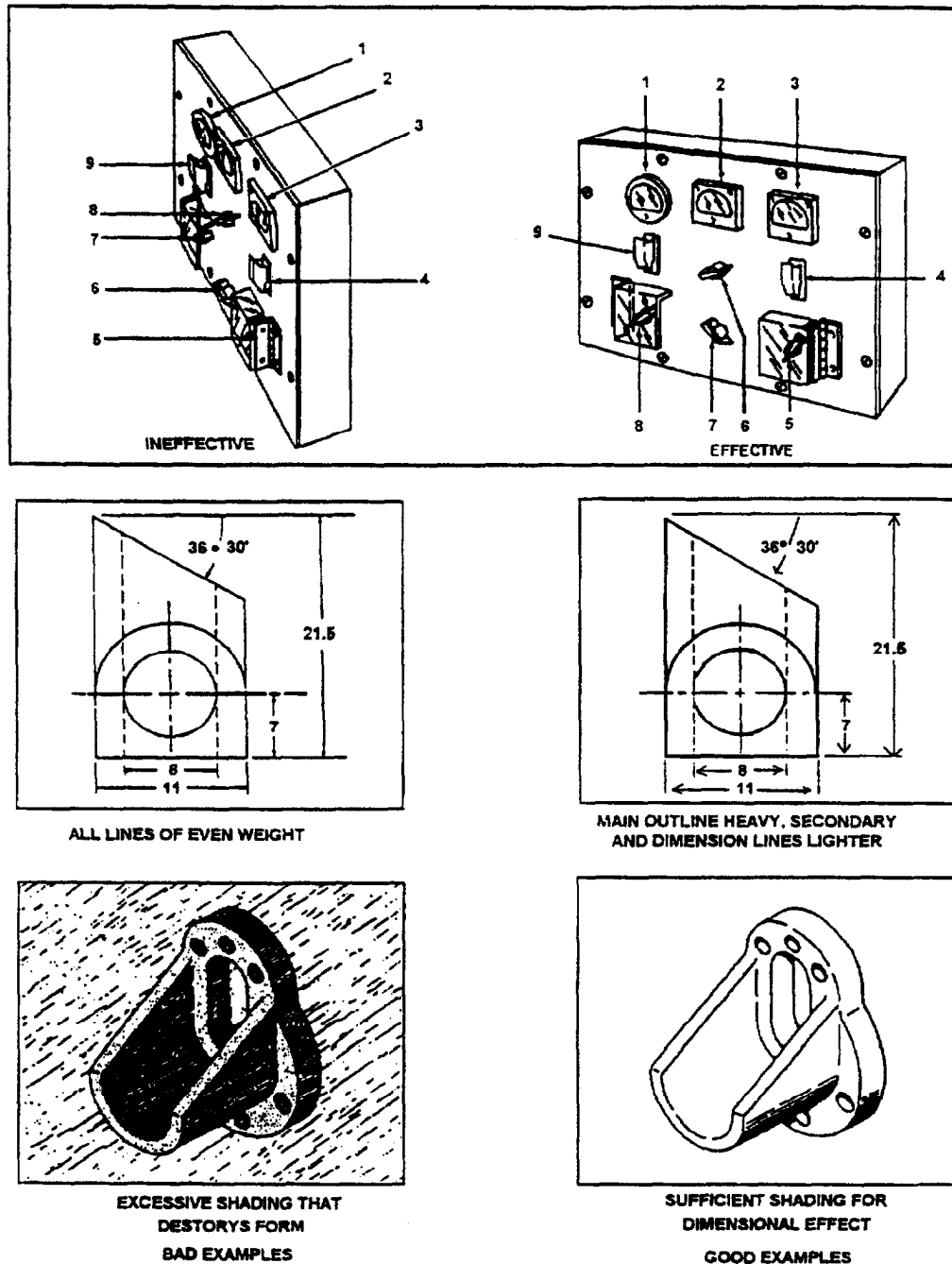
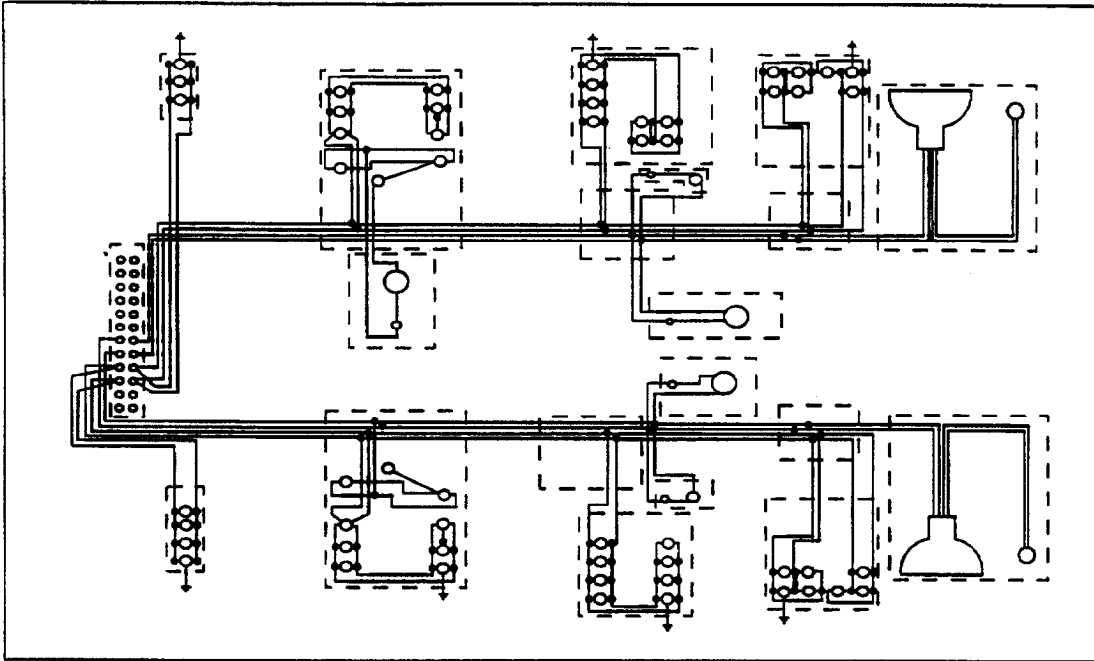
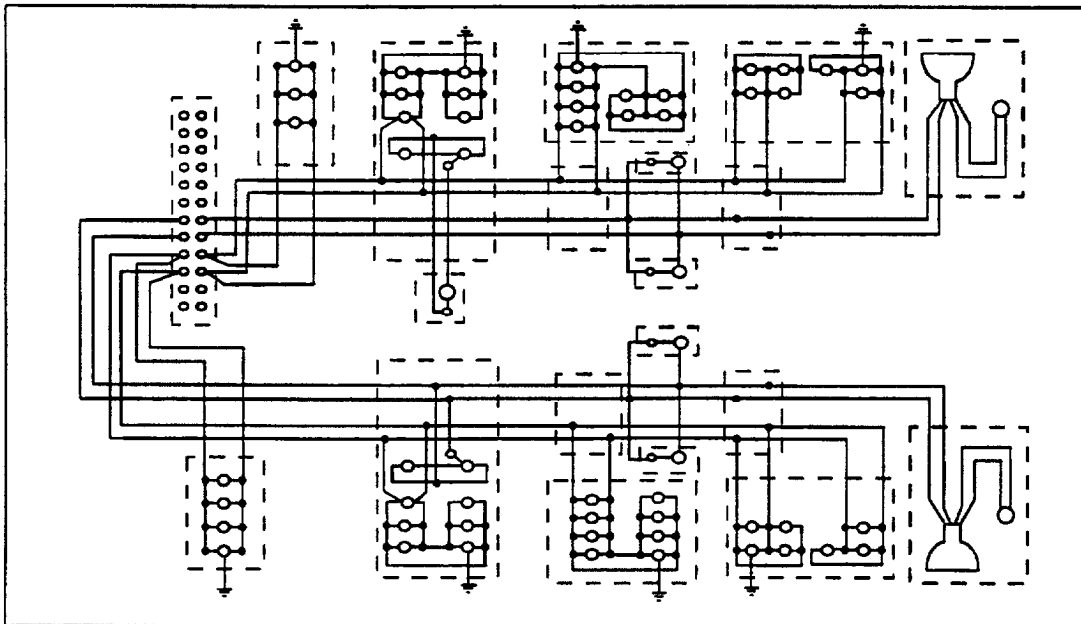


FIGURE 28. Examples of angle view, line weight, and shading



Congested - Hard to Read



Neat - Easy to Read

FIGURE 29. Line separation on diagrams.

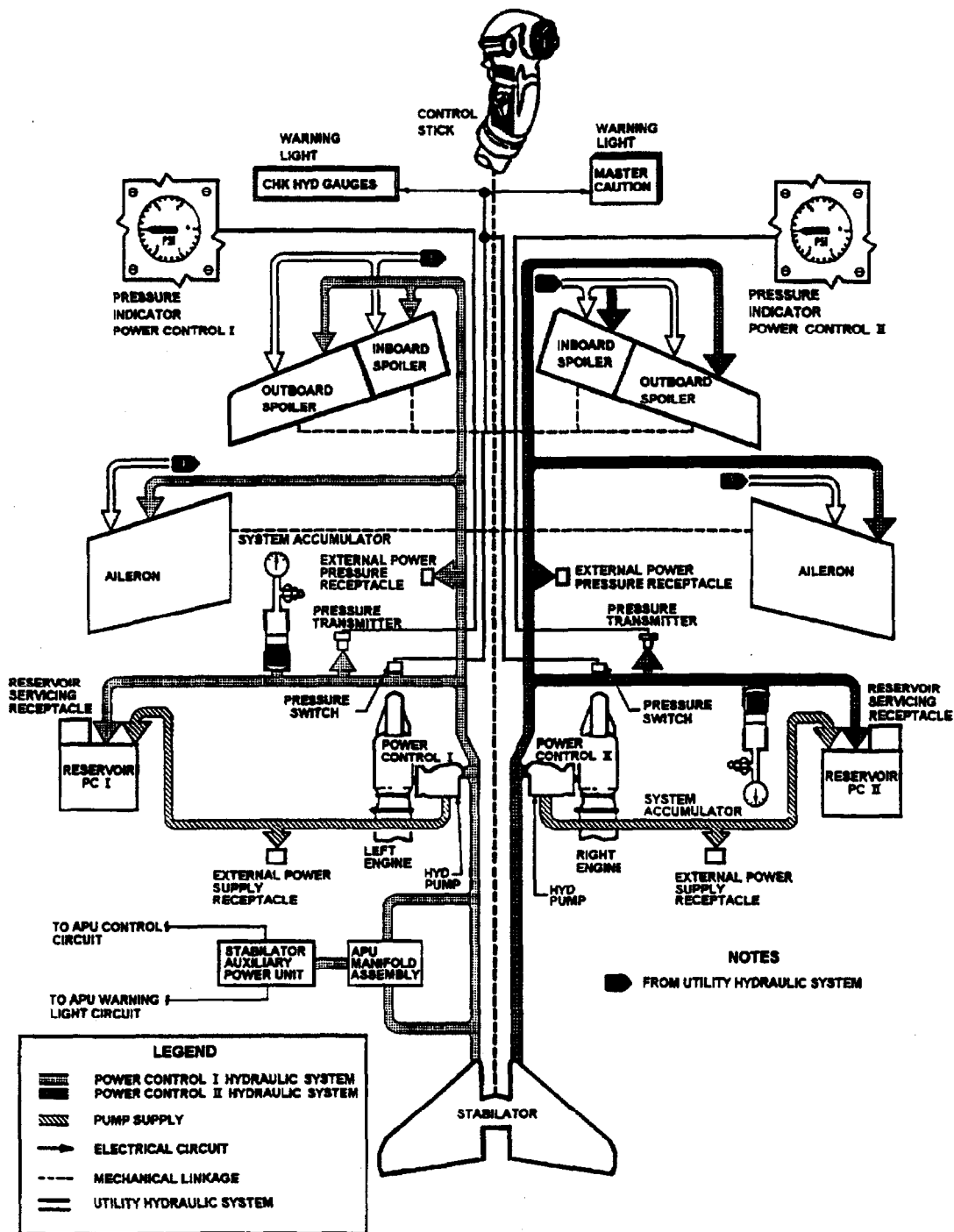


FIGURE 30. Use fo patterns instead of color.

TO XX-XXX-XX-X

CHAPTER 8 DIFFERENCE DATA SHEETS

8.1 INTRODUCTION.

Overhaul and test procedures for models included in this chapter are the same as procedures for Main Landing Gear Assembly, Part No. 12L006-811, except for specific differences noted by the applicable difference data sheet. Chapters 1 and 2 contain complete overhaul instructions for Main Landing Gear Assembly, Part No. 12L006-811.

8.2 INDEX TO PART NUMBERS.

The following index lists applicable part numbers and corresponding page numbers of respective difference data sheets.

Part No.	Page
12L006-807	8-9
12L006-809	8-9
12L006-810	8-9
12L006-814	8-13
12L006-815	8-15
12L006-817	8-17
12L006-819	8-19
12L006-901	8-21
12L006-902	8-21
12L006-903	8-21
12L006-905	8-21
12L006-907	8-25
12L006-909	8-25
12L006-923	8-27
12L006-927	8-27
12L006-929	8-27
12L006-931	8-29
12L006-933	8-29

Part No.	Page
12L006-8	8-3
12L006-801	8-5
12L006-803	8-7

8-1

FIGURE 31. Example first page of difference data chapter.

TO XX-XXX-XX-X

DIFFERENCE DATA SHEET

MAIN LANDING GEAR ASSEMBLY

PART NO. 12L006-8

THE INSTRUCTIONS CONTAINED IN THE PRECEDING CHAPTERS OF THIS TECHNICAL MANUAL APPLY EXCEPT FOR THE DIFFERENCES CITED ON THIS DIFFERENCE DATA SHEET.

LEADING PARTICULARS.

Same as for Part No. 12L006-811 except:

Stroke.....	10.920 to 11.353
Weight.....	6.7 pounds

SPECIAL TOOLS.

Same as for Part No. 12L006-811.

DISASSEMBLY.

Same as for Part No. 12L006-811 (see Figure 1-4) except:

- a. To remove cap (8), cut lockwire on lock (20), loosen lockring (19), then unscrew cap.
- b. Remove piston (18), then remove rings (14 and 16) and packings (15 and 17).

NOTE

Do not remove nameplate (22) from barrel (21).

- c. Remove rod assembly (34), rings (24 and 25) and scraper (31).
- d. Remove bushing (23).

CLEANING.

Same as for Part No. 12L006-811 (see Figure 1-4) except Degreasing Solvent, MIL-S-14756 shall be used to clean the piston (18) and rod assembly (34).

INSPECTION.

Same as for Part No. 12L006-811 (see Figure 1-4) except:

- a. Inspect rod assembly (34) chrome plated surfaces for scoring and scratches. Reject part if plated surface is penetrated.
- b. Inspect bushing (23) for maximum inside diameter of 0.753 inch.
- c. Inspect piston (18) chrome plated surfaces for scoring and scratches. Reject part if plated surface is penetrated.
- d. Inspect spring (4) for minimum length of 1.15 inch with 0.4 pound load applied. Ends of spring must be square to centerline within 5°.

REPAIR AND REPLACEMENT.

Same as for Part No. 12L006-811.

LUBRICATION.

Same as for Part No. 12L006-811.

ASSEMBLY.

Same as for Part No. 12L006-811 (see Figure 1-4) except:

- a. Install trunion (32) by bottoming barrel (21) in trunion. Unscrew barrel (21) until indicator groove in barrel threads is exposed.
- b. Install lockring (19), then screw on cap (8). Tighten lockring. Safety wire cap to lock (20).

8-3/(8-4 blank)

FIGURE 32. Example difference data sheet.

<div><p>CONFIDENTIAL</p><p>TRANSMITTAL NOTICE</p><p>CONFIDENTIAL CHANGE TO A SECRET MANUAL</p><p>Destroy this transmittal notice when the change is incorporated into the basic manual.</p><p>CONFIDENTIAL This page is unclassified.</p></div>

FIGURE 33. Example transmittal cover sheet.

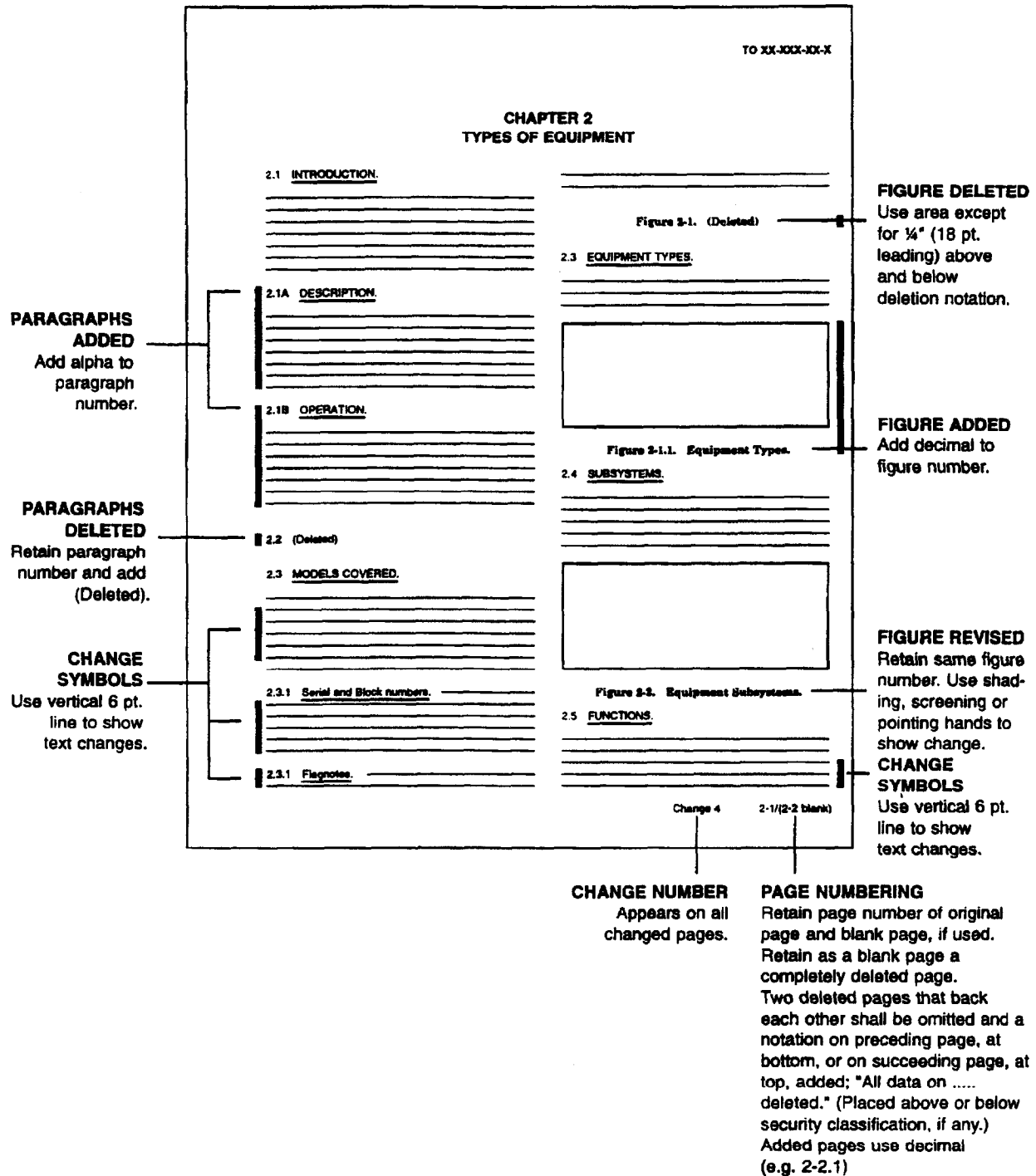


FIGURE 34. Example change page markings.

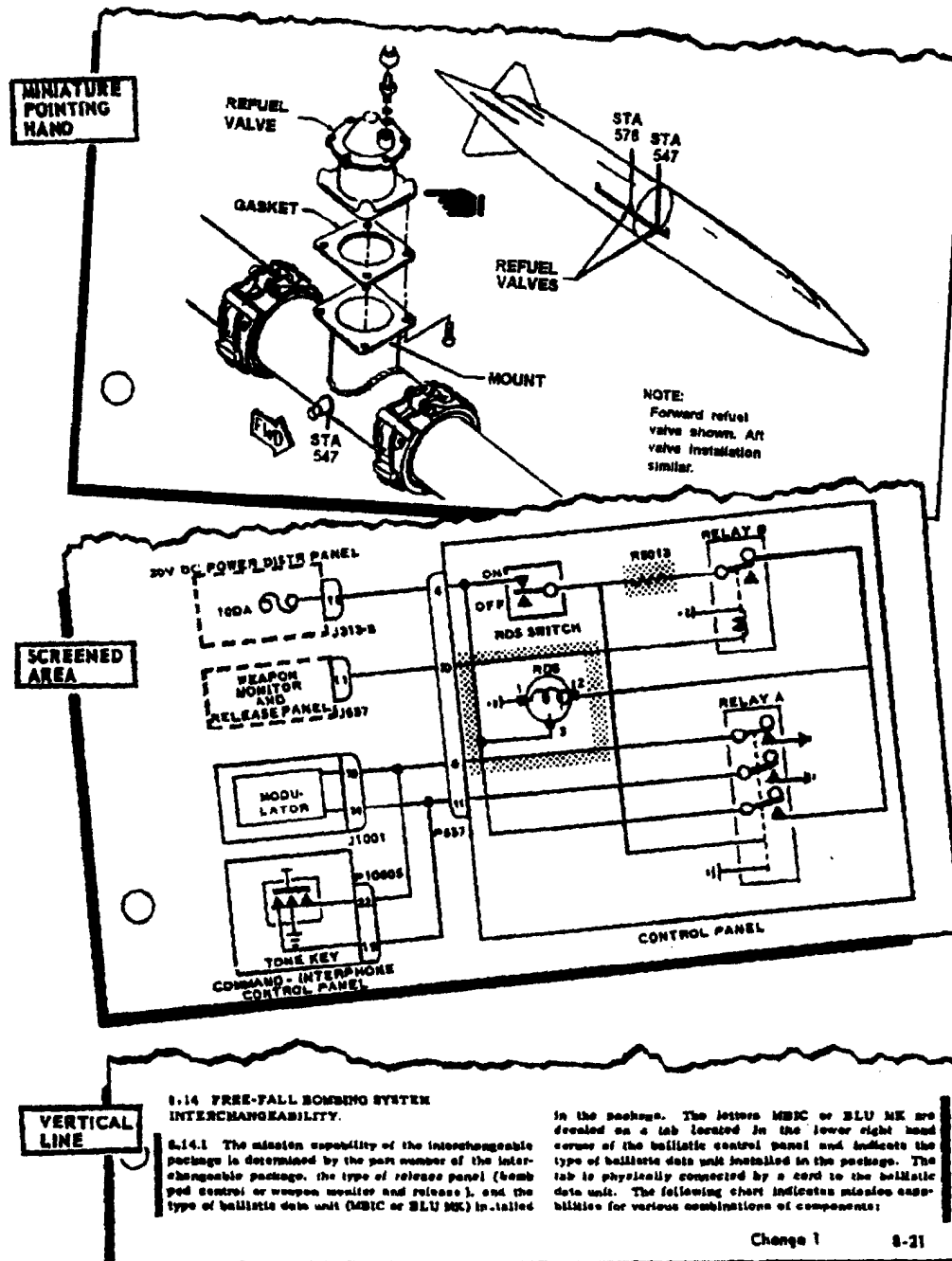


FIGURE 35. Example change symbols.

TM 9-4931-334-14/2
C1

CHANGE**NO. 1**

**HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C. 6 June 1992**

**Operator's Organizational, Direct Support
and General Support Maintenance Manual**

TEST SET**RADAR AN/TPM-22****(4931-707-1229)**

TM 9-4931-334-14/2, 5 June 1990, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.
3. Added or revised illustrations are indicated by a vertical bar adjacent to the illustration identification number.

Remove Pages	Insert Pages	Remove Pages	Insert Pages
5-13 through 5-16	5-13 through 5-16	6-113 and 6-114	6-113 and 6-114
6-1 and 6-2	6-1 and 6-2	6-151 and 6-152	6-151 and 6-152
6-23 and 6-24	6-23 and 6-24	6-167 and 6-168	6-167 and 6-168
6-25 and 6-26	6-25, 6-26, 6-26.1 and 6-26.2	6-177 and 6-178	6-177 and 6-178
6-27 through 6-38	6-27 through 6-38	6-183 through 6-192	6-183 through 6-192
6-43 through 6-46	6-43 through 6-44.4 through 6-46	6-195 through 6-198	6-195 through 6-198
6-51 through 6-56	6-51 through 6-56	6-199 and 6-200	6-199 and 6-200
6-75 through 6-80	6-75 through 6-80, 6-80.1 and 6-80.2	6-213 through 6-216	6-213 through 6-216
6-81 through 6-88	6-81 through 6-88	6-219 through 6-224	6-219 through 6-224
6-95 and 6-96	6-95 and 6-96	B3 and B4	B3 and B4

File this change sheet in front of the publication for reference purposes.

FIGURE 36. (A) Example change instruction sheet.

TO XX-XXX-XX-XTP-1

Paragraph 4.6.4.7, step c. is amended to read:
c. Press 1.

Paragraph 4.6.4.6, step k. is amended to read:
k. Purge with nitrogen in accordance with TO XX-
XXX-XX-X.

FIGURE 39. Example TOPS page.

TO XX-XXX-XX-XTP-1

**TECHNICAL ORDER PAGE SUPPLEMENT
TECHNICAL MANUAL
STORAGE AND MAINTENANCE INSTRUCTIONS**

**BAROSTAT LOCK INITIATOR
PART NO. 90167-3**

USAF SERIES F-1 A AIRCRAFT

This TOPS supplements TO XX-XXX-XX-X dated 4 September 1992, Change 2 dated 12 April 1993. Reference to this supplement will be made on the title page of the basic manual by personnel responsible for maintaining the manual in current status.

**COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SUPPLEMENT TO THE ATTENTION OF ALL
AFFECTED PERSONNEL**

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Published under authority of the Secretary of the Air Force

4 MARCH 1994

LIST OF EFFECTIVE PAGES

NOTE: This TOPS contains supplementary information. Text pages do not supersede pages of basic TO but will be inserted facing the amended page. Total number of effective TOPS pages is 3.

Page No.	Page No.	Page No.	Page No.	Page No.
4-16				
5-14				
5-17				

FIGURE 40. Example TOPS page.

APPENDIX A

GUIDELINES FOR INCLUSION OF OCCUPATIONAL
SAFETY AND HEALTH WARNINGS AND CAUTIONS
IN TECHNICAL MANUALS

A.1 SCOPE.

A.1.1 Scope. This document includes guidance for the inclusion of Occupational Safety and Health (OSH) guidance in the text of Technical Manuals (TM). The intent is to provide sufficient information to allow a standardized approach to the task, eliminate some of the confusion, and improve the TM preparation process overall. It does not apply to Flight Manuals. This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

A-1.2 Philosophy. This standard contains definitions, examples, and general information. This appendix must be used in conjunction with this standard. This appendix contains the following philosophies which are critical to the effective inclusion of OSH guidance in TMs:

- a. TMs cannot be made to be stand-alone safety and health documents. They are but one component of a comprehensive safety and health system that includes, among other things, ongoing industrial hygiene programs, ongoing ground and system safety programs, safety education programs, and worker/management involvement. TMs therefore should support, and be supported by, the entire system.
- b. The "cry wolf" syndrome definitely applies to WARNINGS in TMs and should be avoided. Simply stated, if you warn about everything, you warn about nothing.
- c. Personnel or equipment hazards cannot be controlled strictly through the inclusion of WARNING or CAUTION statements; they are too easily overlooked. Therefore, after exhausting design and engineering considerations, the premium must be on writing effective and safe task procedures. Then WARNINGS and CAUTIONS may be needed to alert and emphasize, but not to provide procedures.

A.2 APPLICABLE DOCUMENTS.

A.2.1 Non-Government Publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

Aerospace Industries Association, PUBS-119 Publications DOD Liaison

Recommendation for Hazardous Materials Warnings in Technical Data

(Application for copies should be addressed to the Aerospace Industries Association, 1250 Eye Street NW, Washington, DC 20005.)

APPENDIX A

A.3 GENERAL GUIDANCE.

A.3.1 Human Factors. TM procedures are subject to being overlooked or circumvented when they are deemed unworkable or impractical. Careful consideration of environmental factors, equipment design or layout, human nature, and other human factors will help ensure the overall integrity of the task procedures.

A.32 When to use WARNING/CAUTION statements.

- a. As indicated by the definition in this standard, WARNING statements are reserved for the protection of personnel and CAUTION statements are reserved for equipment or system protection. Do not use CAUTIONS for health hazards.
 - (1) WARNINGS and CAUTIONS should be used for those unique conditions, steps or processes that require additional emphasis because of the inherently dangerous nature of the task or the potential for a "surprise" not otherwise readily obvious from the procedure.
 - (2) A WARNING should be used to advise of injury or occupational illness potential, but only based on the reasonable likelihood that the reader's health or safety will be impacted in such a manner as to cause immediate concern and a disabling injury or occupational illness will result if the task procedure or stated precaution are not closely followed. Injury is defined as a traumatic bodily harm caused by a single or 1-day exposure to an external force, toxic substance (usually associated with accidents and spills in work places where the specific agent is not normally in the environment), or physical agent which will result in restricted duty, lost time, or worse. The occupational illness is defined as any abnormal physical condition or disorder, other than one resulting from an injury (as defined above), caused by repeated exposure to chemical, biological, or physical agents associated with the occupational environment which will result in restricted duty, lost time, or worse.
 - (3) Specific direction as to which specific procedures require the use of warnings or cautions should be obtained from the Logistics Support Analysis Record (TSAR) and system safety. The responsible safety office also should be requested to review TM procedures for compliance with safety concerns.
- b. Risk assessment - and the related issue of whether or not additional emphasis is required - is somewhat subjective. Decisions concerning these issues should be based on as much information as possible including historical mishap data from related systems, research, and the experience of all those involved in the TM preparation process. Often, the latter is the best indicator of the need for additional comment. Through the acquisition phase of major weapon systems, the decision to include a WARNING or CAUTION statement in the text can often be made by consulting the Operating and Support Hazard Analysis (O&SHA), Preliminary Hazard Analysis (PHA).
- c. WARNINGS or CAUTIONS are not to be used for environmental protection concerns or security information.

APPENDIX A

A.3.3 Wording and structure of WARNING/CAUTION statements.

- a. A WARNING or CAUTION statement should consist of four parts: a signal word (WARNING, CAUTION or Icon [see 3.2.40, 3.2.4 and 3.2.17) a concise statement of the hazard, minimum precautions, and the possible result if the WARNING or CAUTION is disregarded, unless obvious. In cases where hazardous materials are being used and the conditions in A.3.5 e.(2) exist, a hazardous material Icon(s) shall be used. A sample format of these Icons is presented in Figure 19. See paragraph 60 for guidance on constructing the Icons. (N) (M) (F) Icons recommended in the Aerospace Industries Association PUBS-119 document may be used.
- (1) The signal word will always be included using one of the styles, or similar, referenced in this standard. Whichever style is used, it must be used consistently.
 - (2) The remaining parts can be arranged in any way that gets the point across; however, following the hazard statement first, precaution second, and result third format is often the most clear and concise method. Brevity is important. If the possible result is obvious, it need not be included.
 - (3) A precaution is a short statement of hazard mitigation that tells the reader to take care, e.g. "use eye protection", or "keep arms and hands clear". Certain precautions may reference other publications or direct people to consult with another agency (e.g. "...consult Bioenvironmental Engineering"). However, guidance of this nature should be considered for inclusion in a safety summary (see A.3.5).
- b. WARNING or CAUTION statements shall never contain procedures critical to the effective and safe completion of the task. For example:



Cleaning with compressed air can create airborne particles that may enter eyes or penetrate skin. Pressure shall not exceed 30 psig. Wear goggles. Do not direct compressed air against skin.

- c. Negatively worded statements (e.g. "Failure to adhere...", or "Do not use...") are acceptable and sometimes the best way to convey the message.
- d. Multiparagraph or excessively long WARNINGS and CAUTIONS are not specifically disallowed by this standard but lengthy statements are a good indication that the task procedures are not written with the needed safety steps or procedures included.
- e. Pay strict attention to the definitions of "shall", "will", "should", and "may" in this standard. The use of these words must be consistent with exposures or conditions which require comparable WARNINGS or CAUTIONS.

A.3.4 Placement of WARNING/CAUTION statements.

- a. This standard contains general requirements.

APPENDIX A

- b. WARNINGS or CAUTIONS should be placed in the text immediately prior to the step or procedure to which they apply. The same WARNING or CAUTION need not be repeated within a procedure as long as the emphasis and impact of the WARNING or CAUTION is not lost because of a break in the procedures.
- c. There is no stated maximum on the number of unrelated CAUTIONS or WARNINGS that can be placed on a page. Under no conditions should they be so numerous so as to obscure the procedures. Properly written procedures should eliminate the need for consecutive WARNINGS. Sandwiching short (one line or two line) procedures between WARNINGS and CAUTIONS should be avoided.

A.3.5 Safety summary sheets or sections.

- a. All TMs containing warnings or cautions shall have a safety summary. In conjunction with properly written procedures, the Safety Summary can eliminate the need for many WARNINGS or CAUTIONS which can contain general safety precautions.
- b. Provide a Safety Summary in accordance with this standard in the front of the manual preceding the first text page. The safety summary provided in Figure 19 is only an example of the type, depth, and format of general shop safety information necessary. It is not all inclusive. Only the first two paragraphs (see Figure 19), or similar wording detailing the significance and use of WARNING and CAUTION statements, should be considered common to all Safety Summaries. Additional paragraphs can be added depending upon the class of hazard found in the TM.
- c. Nearly any topic can be considered for inclusion in a Safety Summary: mechanized material handling equipment; overhead lifting devices; wood or metal working machine use and guarding; etc. General precautions related to storage, etc, can also be included.
- d. Safety summaries are an excellent place to provide general safety or health instructions, but they must be tailored to the TM.
 - (1) Live circuitry guidance is probably not applicable to a corrosion control TM. This does not preclude the possibility, however, of a WARNING in the text of a corrosion control TM if the text establishes the likelihood of exposure to injurious current.
 - (2) The converse is also true. It would be appropriate to include live circuitry guidance in the Safety Summary of an avionics maintenance manual. However, WARNINGS inserted in the text prior to every point of potential current exposure would not be required, as long as the procedures identify the proper controls, e.g. "discharge capacitor XXXXX," or "... turn off power and tag out (lock out) switch." It is reasonable to assume a trained avionics maintenance technician is fully aware of the hazards of live circuitry; emphasis beyond a Safety Summary would be needed only in the event that the equipment, procedures or work environment presented an unusual situation to the technician.
- e. Inclusion of general guidance in a Safety Summary does not preclude the need for a WARNING or CAUTION if the text calls out a nonroutine use or application.

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- (1) For example: in a parts cleaning TM, general guidance in the Safety Summary related to air pressures (30 psig), chip guarding, eye protection, etc, would suffice as long as the task procedures include the minimum required controls (pressure regulation, etc.) as procedural steps. A CAUTION may still be required, however, if the text specifies 15 psig for a delicate piece of equipment that would be damaged if the technician proceeded under the general guidance included in the Safety Summary.
 - (2) Many industrial hygiene/occupational health concerns can be addressed in the same manner. In TMs that frequently call for routine solvent applications, WARNINGS would not be needed throughout the text as long as the minimum required controls are called for in the task procedures. General guidance regarding solvents could be included in the Safety Summary. Additional emphasis would then be required only if a procedure calls for a nonroutine application, such as heating the solvent, or an unusual, potentially more toxic solvent. In that event, a WARNING could be used depending on the ability of the process to cause immediate safety or health concerns. This approach can be used for many of the occupational health concerns associated with commonly used substances, e.g. hydraulic fluids, oils, fuels, paints, thinners, adhesives, sealants, etc.
- f. WARNINGS or CAUTIONS should not simply be extracted from the text and inserted verbatim in a Safety Summary. An acceptable approach would be to provide a general summary of guidance, classed by exposure. WARNINGS or CAUTIONS must still be placed in the text, however, based on the risk associated with the steps or procedure.
- g. Excessively long Safety Summaries are discouraged. If a TM requires extensive safety or health guidance, a safety section or chapter should be considered.
- h. (F) The above general guidance on Safety Summaries is also applicable to job guide input conditions pages.
- (1) General, tailored guidance can be included in the system level job guide as long as the guidance is tailored to the entire system.
 - (2) General information applicable to an entire procedure should be included on the input conditions pages if it applies to the entire procedure covered.

A.4 POINTS OF CONTACT.

A.4.1 Coordination. All those involved in the TM preparation process must remember that the OSH guidance included in TMs is not the only line of defense against serious mishaps but it is sometimes the last. The effective inclusion of OSH guidance can almost never be accomplished by a single individual with a distinct background. It must be a coordinated effort among system experts, safety professionals, technical writers and the potential user. Questions arising from this process should be referred to the appropriate Safety Office and the acquiring activity. Do not ignore existing contractual or command requirements.

A.5 CONSTRUCTION OF HEALTH HAZARD ICONS.

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A.5.1 Reason for developing the icon (see 3.2.17). Samples of the icons are shown in an example Safety Summary in Figure 19. The major reason for suggesting the use of icons for hazardous materials is to save space in the manuals, while still conveying a clear message of the hazard to the technician using the manual. Since the icon presents a visual image of the hazard rather than a more abstract message, recognition should be much faster than with a worded warning. The task of the graphic designer, in this case, is to make the icon as small as possible, while maintaining enough quality in the image to provide almost instant recognition. An optimum image height of 1/2-inch (three lines) has been selected as the best compromise between image quality and space savings. A bold rectangular outline with rounded corners was also selected for the icon. The width of the icon may vary as necessary for image quality while maintaining the height.

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APPENDIX B

DIGITAL TEMPLATE FOR STANDARD TECHNICAL MANUALS DOCUMENT TYPE DEFINITION

B.1 SCOPE.

B.1.1 Scope. The markup tags described herein are based on rules outlined in MIL-M-28001 and the Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML) Standard, International Organization for Standardization (ISO) 8879, as incorporated in Federal Information Processing Standards (FIPS) 152. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. Digital copies of the DTD (see B.4.1) tag description table (see B.4.2) attribute description table (see B.4.3) and the Formatting Output Specification Instance (FOSI)(see B.5) are available (see B.6). This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

B.2 APPLICABLE DOCUMENTS.

B.2.1 Government documents.

B.2.1.1 Specifications, standards and handbooks. The following specification and standard form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

Military

MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
-------------	--------------------------------------------------------------------------------------------------------

STANDARDS

Federal Information Processing Standards

FIPS 152	Standard Generalized Markup Language (SGML)
----------	---------------------------------------------

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

(Copies of FIPS are available to Department of Defense activities from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

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B.3 DOCUMENT TYPE DEFINITION SUBSET.

B.3.1 SGML document type definition subset. Data to be delivered digitally in accordance with this standard shall be SGML tagged using the DTD found in this Appendix. The procedure for accomplishing this is found in MIL-M-28001 and FIPS 152 (ISO 8879).

B.3.2 Template document type for standard technical manuals. The DTD subset for standard technical manuals is as follows:

```
<!-- The following set of declarations may be referred to by
      using a public entity as follows:
```

```
<!ENTITY % m38784d PUBLIC
      "-//USA-DOD//DTD MIL-M-38784D//EN" >
```

```
%m38784d;
```

```
-->
```

```
<!-- NOTE: In order to parse the following DTD subset alone,
      append the following statement to the beginning of the file:
```

```
      <!DOCTYPE doc [
```

```
and the associated ">" to the end of the file. -->
```

```
<!-- ENTITY DECLARATIONS -->
```

```
<!ENTITY % yesorno "NUMBER" >
```

```
<!ENTITY % secur "security (u | c | s) 'u'">
```

```
<!ENTITY % verified
      "verdate CDATA #IMPLIED
      verrem CDATA #IMPLIED" >
```

```
<!ENTITY % itemid
      "unit CDATA #IMPLIED
      module CDATA #IMPLIED
      lru CDATA #IMPLIED
      compon CDATA #IMPLIED
      partno CDATA #IMPLIED
      refdes CDATA #IMPLIED" >
```

```
<!ENTITY % content
      "skilltrk NMTOKENS #IMPLIED
      contype (desc | proc) #IMPLIED
      assocfig IDREFs #IMPLIED
      assoctab IDREFs #IMPLIED" >
```

```
<!ENTITY % db "%itemid; %content;" >
```

```
<!ENTITY % docatt
      "docid CDATA #IMPLIED
      docstat (revision | change | prelim | draft | formal) 'prelim'
```

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```

verstatpg (all | unverified) 'all'
cover %yesorno; '0'" >

<!ENTITY % change
"inschlvl NMTOKEN #IMPLIED
delchlvl NMTOKEN #IMPLIED
revchg %yesorno; '0'" >

<!ENTITY % bodyatt
"inschlvl NMTOKEN #IMPLIED
delchlvl NMTOKEN #IMPLIED
label CDATA #IMPLIED
sssn CDATA #IMPLIED
%db;" >

<!ENTITY % chapatt
"emergency %yesorno; '0'
id ID #IMPLIED
%bodyatt;" >

<!ENTITY % sectatt "%chapatt;" >

<!ENTITY % para0att
"revchg %yesorno; '0'
emergency %yesorno; '0'
id ID #IMPLIED
hcp %yesorno; '0'
esds %yesorno; '0'
applicref IDREFs #IMPLIED
%verified;
%bodyatt;" >

<!ENTITY % sub1att "%para0att;" >

<!ENTITY % sub2att "%para0att;" >

<!ENTITY % sub3att "%para0att;" >

<!ENTITY % graphatt
"boardno ENTITY #REQUIRED
graphsty NMTOKEN #IMPLIED
llcordra CDATA #IMPLIED
rucordra CDATA #IMPLIED
reprowid NUTOKEN #IMPLIED
reprodep NUTOKEN #IMPLIED
hscale NUMBER #IMPLIED
vscale NUMBER #IMPLIED
scalefit %yesorno; #IMPLIED
hplace (left | right | center) #IMPLIED
vplace (top | middle | bottom) #IMPLIED
coordst CDATA #IMPLIED
coordend CDATA #IMPLIED" >

<!ENTITY % stepatt
"inschlvl NMTOKEN #IMPLIED
delchlvl NMTOKEN #IMPLIED
label CDATA #IMPLIED

```

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```

sssn CDATA #IMPLIED
id ID #IMPLIED
revchg %yesorno; '0'
hcp %yesorno; '0'
esds %yesorno; '0'
applicref IDREFs #IMPLIED
%db;" >

```

```

<!ENTITY % entryatt
"colname NMTOKEN #IMPLIED
spanname NMTOKEN #IMPLIED
morerows NUMBER '0'
colsep %yesorno; #IMPLIED
rowsep %yesorno; #IMPLIED
rotate %yesorno; '0'
valign (top | middle | bottom | #IMPLIED
align (left | right | center | justify | char) #IMPLIED
charoff NUTOKEN #IMPLIED
char CDATA #IMPLIED" >

```

```

<!ENTITY % tabatts
"tabstyle NMTOKEN #IMPLIED
revchg %yesorno; '0'
frame (top | bottom | topbot | all | sides | none ) 'all'
colsep %yesorno; '1'
rowsep %yesorno; '0'
orient (port | land1 | land2) 'port'
pgwide %yesorno; '1'
cellcont (Continued | Cont) 'Continued'
id ID #IMPLIED
%verified;
%bodyatt;
%secur;" >

```

```

<!ENTITY % figatts
"pgwide %yesorno; '1'
orient (port | land1 | land2) 'port'
id ID #IMPLIED
%verified;
%bodyatt;
%secur;" >

```

```

<!ENTITY % lineatt
"quad (left | center | right | justify) left
indent CDATA #IMPLIED " -- specified in ens -->

```

```

<!ENTITY % lrpatts
"tmidwidth NUTOKEN '1.63in'
%para0att;" >

```

```

<!ENTITY % list "randlist | deflist" >

```

```

<!ENTITY % text "(#PCDATA | change | ftnref | xref | indxflag |
verbatim | emphasis | applicabil | graphic | extref | dataiden |
hcp | esds | acronym)+" >

```

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```

<!ENTITY % frnt "idinfo, warnpage?, chginssht?, lep, verstat?,
tpdr?, chgrec?, contents, illuslist?, tablelist?, (foreword |
preface | intro), safesum?" >

<!ENTITY % auxfrnt "idinfo, warnpage?, chginssht?, lep, verstat?,
tpdr?, chgrec?, contents, illuslist?, tablelist?, (foreword |
preface | intro)?, safesum?" >

<!ENTITY % idinf "tmidno+, pretmidno*, (volnum, docpartn)?,
revnum?, doctype, maintlvl?, prtitle, subtitle?, (mfr,
contractno+)?, seal?, supersed?, suppl*, effdatenot?, volnot?,
discl?, distrib, expcont?, destr?, copyright*, authnot, downgrd?,
pubdate, (chgnum, chgdate)?" >

<!ENTITY % fpi "para0, (para applicdef | symsect | abbrsect |
internatlstd | lrp | tctolist ratd)*, tmimprep?" >

<!ENTITY % ddchap "dddesc, (ddindex, ddsheet+)" >

<!ENTITY % rr "appendix*, glossary?, index?, foldsect?" >

<!ENTITY % titles "title" >

<!ENTITY % safesum "para0+" >

<!ENTITY % append "%titles;, para0+" >

<!ENTITY % glossry "deflist" >

<!ENTITY % fig "title, ((subfig, subfig+) | graphic |
macrograph)" >

<!ENTITY % tab1 "%titles;, tgroup+" >

<!ENTITY % stepcon "warning*, caution?, note?, para, note?" >

<!ENTITY % bodyele "chapter, chapter+, ddchapter?" >

<!ENTITY % service "(AF | NAVAIR | NAVSEA | SPAWARS | ARMY | MC |
DLA | CG)" >

<!ENTITY % paracon "(%text; | %list;)+>

<!ENTITY % nparcon "warning*, caution?, note?, %titles;, para,
note?, (step1, step1+) ?">

<!ENTITY % nparcon1 "warning*, caution?, note?, (%titles;)?,
para, note?, (step1, step1+)?" >

<!ENTITY % parazero "%titles;, warning*, caution?, note?, (para,
note?)?, (step1, step1+)?" >

<!ENTITY % chap "%titles;, ((section, section+) | para0+)" >

<!ENTITY % sect "%titles;, para0+" >

```

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```
<!ENTITY % chgsht "chgnum, address, date, prtitle, para?,
chglist, distrib, expcont?" >

<!ENTITY % entry "(%text; | %list; ( warning | caution |
note)+)" >

<!ENTITY % lrp "%parazero;, subpara1*, lrpentry*" >

<!ENTITY % symsect "(%parazero;, subpara1*), (title?, (term,
def)+)" >

<!ENTITY % exclus "figure | table | foldout" >

<!ENTITY % inclus "figure | table | foldout" >

<!ENTITY % ISolat1 PUBLIC
"ISO 8879:1986//ENTITIES Added Latin 1//EN" >

<!ENTITY % ISOgrk3 PUBLIC
"ISO 8879:1986//ENTITIES Greek Symbols//EN" >

<!ENTITY % ISOnum PUBLIC
"ISO 8879:1986//ENTITIES Numeric and Special Graphic//EN" >

<!ENTITY % ISOpub PUBLIC
"ISO 8879:1986//ENTITIES Publishing//EN" >

<!ENTITY % ISOtech PUBLIC
"ISO 8879:1986//ENTITIES General Technical//EN" >

<!ENTITY #default "(!!!! At this point in the tagged instance an
entity was referenced which was not previously defined. Please
correct your work!!! !)" >

<!ENTITY expcontnot "<expcont>WARNING - This document contains
technical data whose export is restricted by the Arms Export
Control Act (Title 22, U.S.C. SEC 2751, <emphasis type='u'>et
</emphasis> <emphasis type='u'>seq</emphasis>.) or the Export
Administration Act of 1979, as amended, Title 50, U.S.C., App
2401 <emphasis type='u'>etc</emphasis> <emphasis type='u'>
seq</emphasis>. Violations of these export laws are subject to
severe criminal penalties. Disseminate in accordance with
provisions of DoD Directive 5230.25.</expcont>" >

<!ENTITY supnotice "A suitable reference to this supplement will
be made on the title page of the basic publication." >

%ISOgrk3; %ISolat1; %ISOnum; %ISOpub; %ISOtech;

<!-- NOTATION DECLARATIONS -->

<!NOTATION cgmbin PUBLIC
"ISO 8632/3//NOTATION CGM Binary text encoding//EN" >

<!NOTATION fax PUBLIC
"-//USA-DOD//NOTATION CCITT Group 4 Facsimile Type1 Untiled Raster//EN" >
```

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```

<!NOTATION faxtile PUBLIC
  "-//USA-DOD//NOTATION CCITT Group 4 Facsimile Type 2 Tiled Raster//EN" >

<!NOTATION iges PUBLIC
  "-//USA-DOD//NOTATION (ASME/ANSI Y14.26M-1987) Initial Graphics Exchange
  Specification//EN" >

<!NOTATION epsi          SYSTEM "Encapsulated PostScript Interchange" >
<!NOTATION eps           SYSTEM "Encapsulated PostScript" >

<!ENTITY esds SYSTEM "esds.eps" NDATA epsi >

<!ENTITY % charent PUBLIC "-//JCALS//ENTITIES supported ISO entities v1//EN">
%charent;

<!-- ##### [SYMBOL DECLARATIONS] ##### -->

<!-- ADDED SYMBOLS THAT ARE CURRENTLY SUPPORTED ON THE JCALS SYSTEM -->

<!ENTITY % eps-big PUBLIC "-//JCALS//ENTITIES big EPS symbols v1//EN">
%eps-big;

<!ENTITY % eps-small PUBLIC "-//JCALS//ENTITIES small EPS symbols v1//EN">
%eps-small;

<!-- ELEMENT and ATTRIBUTE LIST DECLARATIONS -->

<!ELEMENT abbrsect      -o ((%parazero;, subpara1*), (title?,
                           acronymlist)) >
<!ATTLIST abbrsect      %para0att; >

<!ELEMENT acronym      -- (def, term) -(acronym | %exclus;) >

<!ELEMENT acronymlist   -o ((def, term)*) -(acronym | %exclus;) >
<!ATTLIST acronymlist   acrwidth NUTOKEN "0.75in" >

<!ELEMENT activity      -o (#PCDATA) >

<!ELEMENT address       -o (%text;) >

<!ELEMENT appendix      - - (%append;) +(ftnote | %inclus;) >
<!ATTLIST appendix      %chapatt; >

<!ELEMENT applic        -o (term, def) >
<!ATTLIST applic        id ID #REQUIRED >

<!ELEMENT applicabil    -- (%text;) -(applicabil |
                           %exclus;) >
<!ATTLIST applicabil    applicref IDREFS #REQUIRED
                           %secur; >

<!ELEMENT applicdef      - - ((%parazero;, subpara1*), (title?,
                           applichd?, applic+)) >
<!ATTLIST applicdef      termwidth NUTOKEN "1.5in"
                           boxterm %yesorno; "1"
                           %para0att; >

```


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```

<!ELEMENT applichd      - o (term, def) >
<!ELEMENT authnot       - o (#PCDATA) >
<!ELEMENT auxfront      - - (%auxfrnt;) +(ftnote) >
<!ELEMENT body          - - (%bodyele;) +(ftnote) >
<!ELEMENT brk           - o EMPTY >
<!ATTLIST brk           type (col | line | epg | opg | npg) "line" >
<!ELEMENT callout       - o (%text;) >
<!ATTLIST callout       assocfig IDREF #IMPLIED
                        %secur; >
<!ELEMENT caution       - - (para*) -(%list; | %exclus;
                        warning | caution |
                        precaut) >
<!ATTLIST caution       wcnref IDREFS #IMPLIED
                        %change; >
<!ELEMENT change        - - (%text;) -(change | %exclus;) >
<!ATTLIST change        level NMTOKEN #REQUIRED
                        change (add | delete) "add"
                        mark %yesorno; "1"
                        %secur; >
<!ELEMENT chapter       - - (%chap;) +(%inclus;) >
<!ATTLIST chapter       %chapatt; >
<!ELEMENT chgdate       - o (#PCDATA) >
<!ELEMENT chghistdate   - o (#PCDATA) >
<!ELEMENT chginsght     - o (%chgsht;) >
<!ELEMENT chglist       - o (removepg, insertpg)+ >
<!ELEMENT chgnum        - o (#PCDATA) >
<!ELEMENT chgrec        - o EMPTY >
<!ELEMENT colspec       - o EMPTY >
<!ATTLIST colspec       colname NMTOKEN #IMPLIED
                        align (left | right | center | justify | char)
                        #IMPLIED
                        charoff NUTOKEN #IMPLIED
                        char CDATA #IMPLIED
                        leftmar NUTOKEN #IMPLIED
                        rightmar NUTOKEN #IMPLIED
                        topmar NUTOKEN #IMPLIED
                        botmar NUTOKEN #IMPLIED
                        mindepth NUTOKEN #IMPLIED
                        colwidth CDATA #IMPLIED
                        colsep %yesorno; #IMPLIED
                        rowsep %yesorno; #IMPLIED >

```

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<!ELEMENT contents	- o EMPTY >
<!ATTLIST contents	address CDATA #IMPLIED %verified; >
<!ELEMENT contractno	- o (#PCDATA) >
<!ATTLIST contractno	%secur; >
<!ELEMENT copyright	- o (#PCDATA) >
<!ELEMENT dataiden	- - (%text;) - (dataiden %exclus;) >
<!ATTLIST dataiden	type CDATA #REQUIRED %secur; >
<!ELEMENT date	- o (%text;) -(%exclus;) >
<!ELEMENT dateinc	- o (%text;) -(%exclus;) >
<!ELEMENT ddchapter	- - (%ddchap;) +(%inclus;) >
<!ATTLIST ddchapter	%chapatt; >
<!ELEMENT dddesc	- o (%parazero;, subpara1*) >
<!ATTLIST dddesc	%para0att; >
<!ELEMENT ddindex	- o (%parazero;, subpara1*, ddlist) >
<!ATTLIST ddindex	%para0att; >
<!ELEMENT ddlist	- o EMPTY >
<!ELEMENT ddsheet	- - ((nomen, (partno+ modelno+ typedes+), serno*), para0+) >
<!ELEMENT def	- o (%text;) -(%exclus;) >
<!ATTLIST def	%secur; >
<!ELEMENT defhd	- o (term, def) >
<!ELEMENT deflist	- - (title?, defhd?, (term, def)+) >
<!ATTLIST deflist	rtermwidth NUTOKEN "2.5in" ltermwidth NUTOKEN "1in" >
<!ELEMENT destr	- o (%text;) >
<!ELEMENT disc1	- o EMPTY >
<!ATTLIST disc1	disclos1 CDATA #REQUIRED >
<!ELEMENT distrib	- o (#PCDATA) >
<!ATTLIST distrib	type (A B C D E F X) #REQUIRED >
<!ELEMENT doc	- - ((volume, volume+) (front, body, rear?)) +(pgbrk brk subjinfo line) >
<!ATTLIST doc	service %service; #REQUIRED %docatt; >
<!ELEMENT docpart	- - ((front auxfront), body, rear?) >
<!ATTLIST docpart	%bodyatt; >

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<!ELEMENT docpartn	- o (#PCDATA) >
<!ELEMENT doctype	- o (#PCDATA) >
<!ELEMENT downgrd	- o (phrase oadr) >
<!ELEMENT ecjno	- o (%text;) -(%exclus;) >
<!ELEMENT effdatenot	- o (#PCDATA) >
<!ELEMENT emphasis	- - (%text;) -(emphasis %exclus;) >
<!ATTLIST emphasis	type (u b bu i bi q x o) #REQUIRED fontsize NUTOKEN #IMPLIED >
<!ELEMENT entry	- o (%entry;) >
<!ATTLIST entry	%entryatt; %change; %secur; >
<!ELEMENT entrytbl	- - (colspec*, spanspec*, thead?, tbody) - (entrytbl) >
<!ATTLIST entrytbl	cols NUMBER #REQUIRED tgroupstyle NMTOKEN #IMPLIED colref NMTOKEN #IMPLIED spanref NMTOKEN #IMPLIED colsep %yesorno; #IMPLIED rowsep %yesorno; #IMPLIED align (left right center justify char) #IMPLIED charoff NUTOKEN #IMPLIED char CDATA #IMPLIED %secur; >
<!ELEMENT esds	- o EMPTY >
<!ELEMENT expcont	- o (#PCDATA) +(emphasis) >
<!ELEMENT extref	- o EMPTY >
<!ATTLIST extref	xrefid IDREF #REQUIRED >
<!ELEMENT figtable	- - (tgroup+) >
<!ATTLIST figtable	frame (top bottom topbot all sides none) "all" colsep %yesorno; "1" rowsep %yesorno; "0" tbwidth NUTOKEN #IMPLIED tbdepth NUTOKEN #IMPLIED horrefpt (left right) "left" verrefpt (vtop vbottom) "vtop" coordst CDATA "0,10000" assocfig IDREF #IMPLIED %change; %secur; >
<!ELEMENT figure	- - (%fig;) - (%exclus;) >
<!ATTLIST figure	%figatts; >

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<!ELEMENT foldout	- - (%fig;) -(%eXCIUS;) >
<!ATTLIST foldout	pgstyle NUMBER #IMPLIED %figatts; >
<!ELEMENT foldsect	- - (foldout+) >
<!ELEMENT foreword	- - (%fpi;) +(figure I table) >
<!ATTLIST foreword	%verified; >
<!ELEMENT front	- - (%frnt;) +(ftnote) >
<!ELEMENT ftnote	- - (%text; %list;)+ -(ftnote ftnref %exclus;) >
<!ATTLIST ftnote	id ID #REQUIRED %secur; >
<!ELEMENT ftnref	- o EMPTY >
<!ATTLIST ftnref	xrefid IDREF #REQUIRED mark (num sym alpha) "num" >
<!ELEMENT tfnid	- o EMPTY >
<!ATTLIST tfnid	id, ID #REQUIRED tfntype (num alpha) "num" tfnval CDATA #REQUIRED >
<!ELEMENT tfnref	- o EMPTY >
<!ATTLIST tfnref	xrefid IDREF #REQUIRED >
<!ELEMENT tfndisplay	- o EMPTY >
<!ELEMENT glossary	- - (%glossary;) >
<!ATTLIST glossary	%verified; >
<!ELEMENT graphic	EMPTY >
<!ATTLIST graphic	%graphatt; %secur; >
<!ELEMENT hazmat	- o (#PCDATA) >
<!ATTLIST hazmat	%secur; >
<!ELEMENT hcp	- o EMPTY >
<!ELEMENT icon	- o ((macrograph graphic), hazmat, seqno) -(figtable legend) >
<!ATTLIST icon	id ID #IMPLIED >
<!ELEMENT idinfo	- - (%idinf;) >
<!ATTLIST idinfo	tmidnolen NUTOKEN "10em" %verified; >
<!ELEMENT illuslist	- o EMPTY >
<!ATTLIST illuslist	%verified; >
<!ELEMENT index	EMPTY >
<!ATTLIST index	%verified; >

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```

<!ELEMENT indxflag      - o EMPTY >
<!ATTLIST indxflag      ref1 CDATA #REQUIRED
                        ref2 CDATA #IMPLIED
                        ref3 CDATA #IMPLIED
                        ref4 CDATA #IMPLIED
                        %secur; >

<!ELEMENT insertpg      - o (#PCDATA) >

<!ELEMENT internatlst    - o EMPTY >
<!ATTLIST internatlst    Intlstd1 CDATA #REQUIRED
                        Intlstd2 CDATA #REQUIRED
                        %verified;
                        %change; >

<!ELEMENT intro          - - (%fpi;) +(figure | table) >
<!ATTLIST intro          %verified; >

<!ELEMENT item           - o (%text;) -(%exclus;) >
<!ATTLIST item           %secur; >

<!ELEMENT legend         - o (callout, def)+ >
<!ATTLIST legend         assocfig IDREF #IMPLIED
                        numcols (1 | 2) "2"
                        colwidth NUTOKEN "3.5in"
                        cowidth NUTOKEN "0.25in"
                        horrefpt (left | right) "left"
                        verrefpt (top | bottom) "top"
                        coordst CDATA "0,10000" >

<!ELEMENT lep            - - (chghistdate*) >
<!ATTLIST lep            %verified; >

<!ELEMENT line           - o (#PCDATA | emphasis | change)+ >
<!ATTLIST line           prespace CDATA #IMPLIED
                        postspace CDATA #IMPLIED
                        %lineatt;
                        %change; >

<!ELEMENT location       - o (#PCDATA) >

<!ELEMENT lrp            - - (%lrp;) >
<!ATTLIST lrp            %lrpatts; >

<!ELEMENT lrpentry       - o (tmidno, title) >
<!ATTLIST lrpentry       id ID #REQUIRED >

<!ELEMENT macrograph     - - ((graphic | figtable)+, legend?) >
<!ATTLIST macrograph     repropwid NUTOKEN #IMPLIED
                        reprodep NUTOKEN #IMPLIED >

<!ELEMENT maintlvl       - o (#PCDATA) >

<!ELEMENT mfr            - o (#PCDATA) >

<!ELEMENT modelno        - o (%text;) -(%exclus;) >
<!ATTLIST modelno        %secur; >

```

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<!ELEMENT nomen	- o (%text;) -(%exclus;) >
<!ATTLIST nomen	%secur; >
<!ELEMENT note	- - (para*) -(%list* %exclus; precaut warning caution) >
<!ATTLIST note	wcnref IDREFS #IMPLIED %change; >
<!ELEMENT nsn	- o (%text;) >
<!ELEMENT oadr	- o (#PCDATA) >
<!ELEMENT para	- o (%paracon;) >
<!ATTLIST para	id ID #IMPLIED %change; %secur; >
<!ELEMENT para	- o (%parazero;, subpara1*) >
<!ATTLIST para	%para0att; >
<!ELEMENT partno	- o (%text;) -(%exclus;) >
<!ATTLIST partno	%secur; >
<!ELEMENT pgbrk	- o EMPTY >
<!ATTLIST pgbrk	pgumber CDATA #IMPLIED chglevel NMTOKEN #IMPLIED >
<!ELEMENT phrase	- o (#PCDATA) >
<!ELEMENT precaut	- o (%text;) - (%exclus; warning caution precaut) >
<!ATTLIST precaut	%secur; >
<!ELEMENT preface	- - (%fpi;) +(figure table) >
<!ATTLIST preface	%verified; >
<!ELEMENT pretmidno	- o (#PCDATA) >
<!ATTLIST pretmidno	service %service; #IMPLIED %SeCUr; >
<!ELEMENT prttitle	- - ((nomen, (modelno+ partno+ typedes+ pslist nsn+), serno*) subject) >
<!ELEMENT pslist	- o (partno, serno+)+ >
<!ELEMENT pubdate	- o (#PCDATA) >
<!ELEMENT randlist	- - (title?, item+) >
<!ATTLIST randlist	prefix CDATA #IMPLIED >
<!ELEMENT ratd	- - ((%parazero;, subpara1*), (typeno, date?, title, ecpno?, dateinc?, remarks?)* >
<!ATTLIST ratd	%para0att; >
<!ELEMENT rear	- - (%rr;) >

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```

<!ELEMENT remarks      - o (%text;) -(%exclus;) >
<!ATTLIST remarks      %secur; >

<!ELEMENT removepg     - o (#PCDATA) >

<!ELEMENT revnum       - o (#PCDATA) >

<!ELEMENT row          - o (entry | entrytbl)+ >
<!ATTLIST row          rowsep %yesorno; #IMPLIED
                        valign (top | bottom | middle) #IMPLIED >

<!ELEMENT safesum      - - (%safesum;) +(figure | table |
                                warning | caution |
                                precaut) >

<!ATTLIST safesum      %para0att; >

<!ELEMENT seal         - o EMPTY >

<!ELEMENT section      - - (%sect;) >
<!ATTLIST section      %sectatt; >

<!ELEMENT seqno        - o (#PCDATA) >

<!ELEMENT serno        - o (%text;) - (%exclus;) >
<!ATTLIST serno        %change;
                        %secur; >

<!ELEMENT spanspec     - o EMPTY >
<!ATTLIST spanspec     namest NMTOKEN #REQUIRED
                        nameend NMTOKEN #REQUIRED
                        spanname NMTOKEN #IMPLIED
                        align (left | right | center | justify | char)
                                "center"
                        charoff NMTOKEN #IMPLIED
                        char CDATA #IMPLIED
                        colsep %yesorno; #IMPLIED
                        rowsep %yesorno; #IMPLIED >

<!ELEMENT step1        - o (%stepcon;, (step2, step2+)?) >
<!ATTLIST step1        %stepatt; >

<!ELEMENT step2        - o (%stepcon;, (step3, step3+)?) >
<!ATTLIST step2        %stepatt; >

<!ELEMENT step3        - o (%stepcon;, (step4, step4+)?) >
<!ATTLIST step3        %stepatt; >

<!ELEMENT step4        - o (%stepcon;) >
<!ATTLIST step4        %stepatt; >

<!ELEMENT subfig       - - (graphic | macrograph) >
<!ATTLIST subfig       orient (port | land1) 'port'
                        inschlvl NMTOKEN #IMPLIED
                        delchlvl NMTOKEN #IMPLIED
                        %secur; >

```

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<!ELEMENT subject	- o (#PCDATA) >
<!ATTLIST subject	%secur; >
<!ELEMENT subjinfo	- o EMPTY >
<!ATTLIST subjinfo	subjup CDATA #REQUIRED
	subjlwr CDATA #REQUIRED
	infoup CDATA #REQUIRED
	infolwr CDATA #REQUIRED >
<!ELEMENT subpara1	- o (%nparcon;, subpara2*) >
<!ATTLIST subpara1	%sub1att; >
<!ELEMENT subpara2	- o (%nparcon1;, subpara3*) >
<!ATTLIST subpara2	%sub2att; >
<!ELEMENT subpara3	- o (%nparcon1;) >
<!ATTLIST subpara3	%sub3att; >
<!ELEMENT subtitle	- o (#PCDATA) >
<!ATTLIST subtitle	%secur; >
<!ELEMENT supersed	- o (#PCDATA) >
<!ELEMENT supply	- o (#PCDATA) >
<!ELEMENT symsect	- o (%symsect;) >
<!ATTLIST symsect	termwidth NUTOKEN "0.75in"
	%para0att; >
<!ELEMENT table	- - (%tab1;) - (%exclus;) +(tfnid tfnref
tfndisplay)>	
<!ATTLIST table	%tabatts; >
<!ELEMENT tablelist	- o EMPTY >
<!ATTLIST tablelist	%verified; >
<!ELEMENT tbody	- o (row+) >
<!ATTLIST tbody	valign (top middle bottom) "top" >
<!ELEMENT tctolist	- - (%parazero;, subpara1*, tctotbl?) >
<!ATTLIST tctolist	%para0att; >
<!ELEMENT tctono	- o (#PCDATA) -(%exclus;) >
<!ATTLIST tctono	%change; >
<!ELEMENT tctorow	- o (tctono, title, date) >
<!ATTLIST tctorow	%change; >
<!ELEMENT tctotbl	- - (tctorow+) >
<!ATTLIST tctotbl	revchg %yesorno; "0"
	frame (top bottom topbot all
	sides none) "all"
	colsep %yesorno; "1"
	rowsep %yesorno; "0"
	cellcont (Continued Cont) "Continued"
	id ID #IMPLIED
	collwidth CDATA "1in"

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```

col2width CDATA #FIXED ""
col3width CDATA #FIXED "8em"
%verified;
%bodyatt;
%secur; >

<!ELEMENT term          - o (%text;) -(%exclus;) >
<!ATTLIST term          %secur; >

<!ELEMENT tgroup        - o (colspec*, spanspec*, thead?, tbody) >
<!ATTLIST tgroup        cols NUMBER #REQUIRED
                        tgroupstyle NMTOKEN #IMPLIED
                        colsep %yesorno; #IMPLIED
                        rowsep %yesorno; #IMPLIED
                        align (left | right | center | justify |
                                char) "left"
                        charoff NDTOKEN #IMPLIED
                        char CDATA #IMPLIED >

<!ELEMENT thead         - o (colspec*, row+) -(entrytbl) >
<!ATTLIST thead         valign (top | middle | bottom) "bottom" >

<!ELEMENT title         - o (%text;) - (%exclus;) >
<!ATTLIST title         %secur; >

<!ELEMENT tmidno        - o (%text;) -(%exclus;) >
<!ATTLIST tmidno        service %service; #IMPLIED
                        %change;
                        %secur; >

<!ELEMENT tmimprep      - - (%parazero;, subparal*) >
<!ATTLIST tmimprep      %paraOatt; 5

<!ELEMENT tpdrr - - (activity, tpdrrno, location)+ >

<!ELEMENT tpdrrno       - o (#PCDATA) >
<!ATTLIST tpdrrno       %secur; >

<!ELEMENT typedes       - o (%text;) -(%exclus;) >
<!ATTLIST typedes       %secur; >

<!ELEMENT typenO        - o (%text;) -(%exclus;) >
<!ATTLIST typenO        %secur; >

<!ELEMENT verbatim      - - CDATA >
<!ATTLIST verbatim      allowbrk %yesorno; "1"
                        %secur; >

<!ELEMENT verstat       - o EMPTY >

<!ELEMENT volnot        - o (#PCDATA) >

<!ELEMENT volnum        - o (#PCDATA) >

<!ELEMENT volume        - - ((docpart, docpart+) | ((front |
                                auxfront), body, rear?)) >
<!ATTLIST Volume        %bodyatt; >

```

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<!ELEMENT warning	- - (icon?, para*) -(%list; %exclus; warning caution precaut) >
<!ATTLIST warning	wcnref IDREFS #IMPLIED %change; >
<!ELEMENT warnpage	- o (wpgentry+) 5
<!ATTLIST warnpage	inschlvl NMTOKEN #IMPLIED delchlvl NMTOKEN #IMPLIED %verified: >
<!ELEMENT wpgentry	- o (title, para+) >
<!ATTLIST wpgentry	warnbox %yesorno; #IMPLIED titlefont (10pt 14pt) "14pt" line %yesorno; #IMPLIED >
<!ELEMENT xref	- o EMPTY >
<!ATTLIST xref	xrefid IDREF #REQUIRED >

B.4 DETAILED DESCRIPTION.

B.4.1 Document type definition. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. The DTD is available in a digital format. See B.6, for information on obtaining the file.

B.4.2 Tag description table. The Tag Description Table provides detailed descriptions of the tags above. It provides the element tagging structure, full element name, tag minimization requirements, element structure, referencing elements, source paragraph, and attribute descriptions unique to the element. See B.6, for information on obtaining this table.

B.4.3 Attribute description table. This Attribute Description Table provides detailed descriptions of the attributes above. See B.6, for information on obtaining this table.

B.5 FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI).

B.5.1 FOSI description. The FOSI provides instructions to the output system to produce a formatted manual from the tagged instance. The FOSI is provided as Government Furnished Information (GFI). See B.6, for information on obtaining the FOSI.

B.6 OBTAINING FILES.

B.6.1 Obtaining files. The DTD, attribute and tag description tables are available as ASCII files by either of two methods (see B.6.1.1 and B.6.1.2). In the event of a conflict between the text of this document and any downloaded files, the text of this document takes precedence. These files are for convenience and informational purposes only.

B.6.1.1 File Transfer Protocol (FTP). The procedures for obtaining files via FTP are as follows.

- a. Connect to "WPAFTB1.wpafb.af.mil" using the FTP software available at your site. For example, if your FTP software is invoked using the "ftp" command, type "ftp

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WPAFTB1.wpafb.af.mil". Do not attempt to log-in to this site using a "telnet" connection. If this connection fails, connect using "129.52.100.1".

- b. Log-in (login, name, remote user name, etc.) as "ftp" and press "enter".
- c. For password, type electronic mail (e-mail) name followed by "@," (at) and press "enter".
- d. Type "cd sgml" (or the command your system requires to change to "sgml" (directory) and press "enter". At this point, a short new users message will normally appear. If the new users message does not appear, it should be downloaded and read. Download file by typing "get.message" (or the command your system requires to download a file) and press "enter".
- e. Type "get filelist.txt" (or the command your system requires to download a file) and press "enter". This file contains a list of all files available. This file is updated as new items are added, therefore it should be downloaded and read before downloading any other file.
- f. If the needed file ends with ".zip", see g. below, otherwise type "asc" (or the command your system requires for an ASCII transfer) and press "enter". Type "get XXXXXXXXXX" (where XXXXXXXXXX is the name of the file to be downloaded) and press "enter" to download needed file. Repeat for each file to be downloaded.
- g. If the needed file ends with ".zip", type "bin" (or the command your system requires for a binary transfer) and press "enter". Type "get XXXXXXXXXX" (where XXXXXXXXXX is the name of the file to be downloaded) and press "enter" to download needed file. Repeat for each file to be downloaded. Zipped files were compressed using PKZIP Version 2.04
- h. File "nc.txt" contains information on the naming conventions used on all files in this directory. Type "get nc.txt" to download this file.

B.6.1.2 Bulletin Board System (BBS). The procedure for obtaining files via the Air Force Continuous Acquisition and Life-Cycle Support (AF CALS) BBS are as follows. (There is currently no charge for an account on this BBS.)

- a. Connect to the AF CALS BBS by dialing commercial 513-476-1273 or Defense Switched Network (DSN) 986-1273.
- b. To open a new account, type "new" and press "enter". Answer questions. If an account already exists, type the appropriate "User-ID" and press "enter".
- c. At the main menu, type "2" and press "enter".
- d. Type "1 dtd" and press "enter" to access the library.
- e. Type "3 filelist.txt" and press "enter". Select option. This file contains a list of all files available. This file is updated as new items are added, therefore it should be downloaded and read before downloading any other file.

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- f. Type "3 XXXXXX.XXX" (where XXXXXXXXXX is the name of the file to be downloaded) and press "enter". Select option to download selected file.
- g. If the needed file ends with ".zip", type "3 pkunzip.exe" and press "enter". Select option to download selected file. To uncompress the file, type "pkunzip XXXXXXXXXX" (where XXXXXXXXXX is the name of the file to be uncompressed).
- h. File "nc.txt" contains information on the naming conventions used on all files in this directory. Type "3 nc.txt" to download this file.

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APPENDIX C

SUPPLEMENTAL TECHNICAL MANUALS DOCUMENT TYPE DEFINITION SUBSET

C.1 SCOPE.

C.1.1 Scope. The markup tags described herein are based on rules outlined in MIL-M-28001 and the Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML) Standard, International Organization for Standardization (ISO) 8879, as incorporated in Federal Information Processing Standards (FIPS) 152. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. Digital copies of the DTD (see C.4.1), tag description table (see C.4.2), attribute description table (see C.4.3), and the Formatting Output Specification Instance (FOSI) (see C.5) are available (see Appendix B, B.6). This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

C.2 APPLICABLE DOCUMENTS.

C.2.1 Government documents.

C.2.1.1 Specifications, standards and handbooks. The following specification and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

Military

MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
-------------	--------------------------------------------------------------------------------------------------------

STANDARDS

Federal Information Processing Standards

FIPS 152	Standard Generalized Markup Language (SGML)
----------	---------------------------------------------

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

(Copies of FIPS are available to Department of Defense activities from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

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C.3 DOCUMENT TYPE DEFINITION SUBSET.

C.3.1 SGML document type definition subset. Data to be delivered digitally in accordance with this standard shall be SGML tagged using the DTD found in Appendix B as modified by the DTD subset in this section. The procedure for accomplishing this is found in MIL-M-28001 and FIPS 152 (ISO 8879).

C.3.2 Template document type for supplemental technical manuals. The DTD subset for supplemental technical manuals is as follows:

```
<!-- The following set of declarations may be referred to by
      using a public entity as follows:
```

```
<!ENTITY % m38784d-c PUBLIC
      "-//USA-DOD//DTD MIL-M-38784D SUPPLEMENTAL MANUALS//EN" >
```

```
%m38784d-c;
```

```
-->
```

```
<!-- NOTE: In order to parse the following DTD subset alone,
      append the following statement to the beginning of the file:
```

```
      <!DOCTYPE docsuppman [
```

```
and the associated ">" to the end of the file. -->
```

```
<!-- ENTITY DECLARATIONS -->
```

```
<!ENTITY % bodyele "chapter+" >
```

```
<!ENTITY % m38784d PUBLIC "-//USA-DOD//DTD MIL-M-38784D//EN" >
```

```
%m38784d;
```

```
<!-- ELEMENT and ATTRIBUTE LIST DECLARATIONS -->
```

```
<!ELEMENT docsuppman      - - (front, body, rear?) +(p g brk |
                                     brk |
                                     subjinfo) >
```

```
<!ATTLIST docsuppman      service %service; #REQUIRED
                             %docatt; >
```

C.4 DETAILED DESCRIPTION.

C.4.1 Document type definition. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. The DTD is available in a digital format. See Appendix B, B.6, for information on obtaining the file.

C.4.2 Tag description table. The Tag Description Table provides detailed descriptions of the tags above. It provides the element tagging structure, full element name, tag minimization requirements, element structure, referencing elements, source paragraph, and attribute descriptions unique to the element. See Appendix B, B.6, for information on obtaining this table.

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C.4.3 Attribute description table. This DTD uses the same attribute description table as the standard technical manual DTD (see Appendix B, B.4.1).

C.5 FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI).

C.5.1 FOSI description. The FOSI provides instructions to the output system to produce a formatted manual from the tagged instance. The FOSI is provided as Government Furnished Information (GFI). See Appendix B, B.6, for information on obtaining the FOSI.

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APPENDIX D

TECHNICAL MANUAL SUPPLEMENTS DOCUMENT TYPE DEFINITION SUBSET

D.1 SCOPE.

D.1.1 Scope. The markup tags described herein are based on rules outlined in MIL-M-28001 and the Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML) Standard, International Organization for Standardization (ISO) 8879, as incorporated in Federal Information Processing Standards (FIPS) 152. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. Digital copies of the DTD (see D.4.1) tag description table (see D.4.2), attribute description table (see D.4.3), and the Formatting Output Specification Instance (FOSI) (see D.5) are available (see Appendix B, B.6). This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

D.2 APPLICABLE DOCUMENTS.

D.2.1 Government documents.

D.2.1.1 Specifications, standards and handbooks. The following specification and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

Military

MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
-------------	--------------------------------------------------------------------------------------------------------

STANDARDS

Federal Information Processing Standards

FIPS 152	Standard Generalized Markup Language (SGML)
----------	---------------------------------------------

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

(Copies of FIPS are available to Department of Defense activities from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

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D.3 DOCUMENT TYPE DEFINITION SUBSET.

D.3.1 SGML document type definition subset. Data to be delivered digitally in accordance with this standard shall be SGML tagged using the DTD found in Appendix B as modified by the DTD subset in this section. The procedure for accomplishing this is found in MIL-M-28001 and FIPS 152 (ISO 8879).

D.3.2 Template document type for technical manual supplements. The DTD subset for technical manual supplements is as follows. See Appendix B, B.6, for information on obtaining this DTD.

<!-- The following set of declarations may be referred to by
using a public entity as follows:

<!ENTITY % m38784d-d PUBLIC
"-//USA-DOD//DTD MIL-M-38784D SUPPLEMENTS//EN" >

%m38784d-d;

-->

<!-- NOTE: In order to parse the following DTD subset alone,
append the following statement to the beginning of the file:

<!DOCTYPE docsupp [

and the associated "]">" to the end of the file. -->

<!-- ENTITY DECLARATIONS -->

<!ENTITY % docatt
"docid CDATA #IMPLIED
docstat (prelim | draft | formal) 'prelim'
supptype (safety | routine | operational | tops) #REQUIRED" >

<!ENTITY % idinf "(tmidno+, doctype, prtitle, subtitle?,
superseded?, suppl*, respnot, effdatenot?, distrib, expcont?,
destr?, authnot , downgrd? , pubdate)" >

<!ENTITY % frnt "idinfo" >

<!ENTITY % bodyele "(para, (warning | caution | note | para0 |
subpara1 | subpara2 | subpara3 | step1 | step2 | step3 | step4 |
figure | table)?)+>" >

<!ENTITY % text "(#PCDATA | verbatim | emphasis | graphic |
dataiden | hcp | esds)+>" >

<!ENTITY % m38784d PUBLIC "-//USA-DOD//DTD MIL-M-38784d//EN" >

<!ENTITY resptime "COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS
SUPPLEMENT TO THE ATTENTION OF ALL AFFECTED PERSONNEL." >

%m38784d;

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<!-- ELEMENT and ATTRIBUTE LIST DECLARATIONS -->

```
<!ELEMENT docsupp      - - (front, body) +(p|brk | brk) >
<!ATTLIST docsupp      service %service; #REQUIRED
                        %docatt; >

<!ELEMENT respnot      - o (#PCDATA) >
```

D.4 DETAILED DESCRIPTION.

D.4.1 Document type definition. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. The DTD is available in a digital format. See Appendix B, B.6, for information on obtaining the file.

D.4.2 Tag description table. The tag description table provides detailed descriptions of the tags above. It provides the element tagging structure, full element name, tag minimization requirements, element structure, referencing elements, source paragraph, and attribute descriptions unique to the element. See Appendix B, B.6, for information on obtaining this table.

D.4.3 Attribute description table. This DTD uses the same attribute description table as the standard technical manual DTD (see Appendix B, B.4.1).

D.5 FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI).

D.5.1 FOSI description. The FOSI provides instructions to the output system to produce a formatted manual from the tagged instance. The FOSI is provided as Government Furnished Information (GFI). See Appendix B, B.6, for information on obtaining the FOSI. The FOSI for supplements is currently under development and is not yet available.

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APPENDIX E

BRIEF MANUALS
DOCUMENT TYPE DEFINITION SUBSET

E.1 SCOPE.

E.1.1 Scope. The markup tags described herein are based on rules outlined in MIL-M-28001 and the Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML) Standard, International Organization for Standardization (ISO) 8879, as incorporated in Federal Information Processing Standards (FIPS) 152. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. Digital copies of the DTD (see E.4.1), tag description table (see E.4.2), attribute description table (see E.4.3) and the Formatting Output Specification Instance (FOSI) (see E.5) are available (see Appendix B, B.6). This Appendix is a mandatory part of this standard. The information contained herein is intended for compliance.

E.2. APPLICABLE DOCUMENTS.

E.2.1 Government documents.

E.2.1.1 Specifications, standards and handbooks. The following specification and standard form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

Military

MIL-M-28001	Markup Requirements and Generic Style Specification for Electronic Printed Output and Exchange of Text
-------------	--------------------------------------------------------------------------------------------------------

STANDARDS

Federal Information Processing Standards

FIPS 152	Standard Generalized Markup Language (SGML)
----------	---------------------------------------------

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

(Copies of FIPS are available to Department of Defense activities from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

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E.3 DOCUMENT TYPE DEFINITION SUBSET.

E.3.1 SGML document type definition subset. Data to be delivered digitally in accordance with this standard shall be SGML tagged using the DTD found in Appendix B as modified by the DTD subset in this section. The procedure for accomplishing this is found in MIL-M-28001 and FIPS 152 (ISO 8879).

E.3.2 Template document type for brief manuals. The DTD subset for brief manuals is as follows. See Appendix B, 60., for information on obtaining this DTD.

<!-- The following set of declarations may be referred to by
using a public entity as follows:

```
<!ENTITY % m38784d-e PUBLIC
"-//USA-DOD//DTD MIL-M-38784D BRIEF MANUALS//EN" >
```

%m38784d-e;

-->

<!-- NOTE: In order to parse the following DTD subset alone,
append the following statement to the beginning of the file:

```
<!DOCTYPE docbrief [
```

and the associated "]>" to the end of the file. -->

<!-- ENTITY DECLARATIONS -->

```
<!ENTITY % docatt
"docid CDATA #IMPLIED
docstat (revision | prelim | draft | formal) 'prelim'
verstatpg (all | unverified) 'all'" >
```

```
<!ENTITY % idinf "(tmidno+, revnum?, doctype, maintlvl?, prttitle,
subtitle?, (mfr, contractno+)?, supersed?, suppl*, effdatenot?,
distrib, expcont?, destr?, authnot, downgrd?, pubdate)" >
```

```
<!ENTITY % frnt "idinfo, warnpage?, verstat?, tpdr?, contents?,
(foreword | preface | intro)?, safesum?" >
```

```
<!ENTITY % bodyele "chapter+ | para0+" >
```

```
<!ENTITY % m38784d PUBLIC "-//USA-DOD//DTD MIL-M-38784D//EN" >
```

%m38784d;

<!-- ELEMENT and ATTRIBUTE LIST DECLARATIONS -->

```
<!ELEMENT docbrief      - - (front, body) (change | indxflag)
                        +(pgbrk | brk | figure | table |
                          subjinfo) >
```

```
<!ATTLIST docbrief      service %service; #REQUIRED
                        %docatt; >
```

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APPENDIX E

E.4 DETAILED DESCRIPTION.

E.4.1 Document type definition. The DTD subset within this appendix provides the structure and content of documents prepared in accordance with this standard. The DTD is available in a digital format. See Appendix B, B.6, for information on obtaining the file.

E.4.2 Tag description table. The tag description table provides detailed descriptions of the tags above. It provides the element tagging structure, full element name, tag minimization requirements, element structure, referencing elements, source paragraph, and attribute descriptions unique to the element. See Appendix B, B.6, for information on obtaining this table.

E.4.3 Attribute description table. This DTD uses the same attribute description table as the standard technical manual DTD (see Appendix B, B.4.1).

E.5 FORMATTING OUTPUT SPECIFICATION INSTANCE (FOSI).

E.5.1 FOSI description. The FOSI provides instructions to the output system to produce a formatted manual from the tagged instance. The FOSI is provided as Government Furnished Information (GFI). See Appendix B, B.6, for information on obtaining the FOSI. The FOSI for brief manuals is currently under development and is not yet available.

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